I·T·R

THE IRON TRADE REVIEW

Volume LV Cleveland December 10, 1914 *No. 24*

Pig Iron Buying Continues

Pittsburgh, Chicago and Philadelphia Add Large Tonnages—
Stronger Sentiment in Finished Lines

Active buying of pig iron has continued during the past week in leading centers, although naturally there was some decrease in orders in markets in which buying was very heavy in the preceding two weeks. Finished materials apparently have started to go through the same stages of progress as have characterized the pig iron situation. At present, there is a decided improvement in sentiment in finished materials and it is confidently expected that orders will come in freely early in the new year, but such selling as is now being done is at extremely low prices, and the usual holiday lull preceding New Year's day is expected.

Pig Iron

The sales of pig iron during the recent period of activity in Chicago are estimated at about 200,000 tons and very fair activity still continues in that district. At Pittsburgh, the Standard Sanitary Mfg. Co. purchased 24,000 tons of northern and southern grades, the former at $13.50 to $13.95, Pittsburgh, and the latter at $9.50 to $9.75, southern furnaces. Sales of the week at Pittsburgh have amounted to about 50,000 tons. Buying in the Philadelphia district has been well maintained and transactions amounted to about 50,000 tons. Eastern Pennsylvania and New York furnaces have disposed of 12,000 to 15,000 tons of low phosphorus pig iron. Sales at St. Louis during the past week amounted to about 20,000 tons of various grades and an equal tonnage is pending. Valley prices now range from $13 to $13.50 for No. 2 foundry.

Finished Material

The tin plate market has opened at $3.50 per base box and consumers are showing considerable interest. Representatives of leading contractors for structural material have accepted the invitation of the government of France and have gone to that country to look over the ground with a view to making contracts for material for the reconstruction of bridges destroyed by war operations. New bookings of structural contracts are light and some very low prices are being made. An order for 25,000 steel barrels for export to Russia has been placed in this country. The barrels are to be made of galvanized sheets. A similar order was recently placed with a Cleveland manufacturer. Railroad buying is not showing much improvement. The Chesapeake & Ohio has purchased 1,500 tons of steel bars, and the Norfolk & Western and the B. & O. are also in the market for bars. The Santa Fe railroad has entered an order for 54,000 tons of steel rails. An order for railroad sleepers for export to Greece will call for about 35,000 tons of plates.

Coke

Contracts involving about 60,000 tons per month for the first half of next year have been placed by furnaces at Pittsburgh. A New York state furnace has purchased 80,000 tons for shipment throughout 1915 at slightly more than $1.75 per ton. The scrap market is showing improvement in some centers and prices are being slightly marked up. Improvement so far, however, has not been decided.

Cast Iron Pipe

The Board of Water Commissioners of Detroit has offered to award the Detroit plant of the American Car & Foundry Co. 25,000 tons of cast iron pipe, if it will accept $21.45 per ton, which is slightly lower than the bid of the Warren Foundry & Pipe Co.,

THE OPEN HEARTH

Great Northern Ore and the Market

AS ANNOUNCED in THE IRON TRADE REVIEW, Dec. 3, the trustees of the Great Northern ore properties have made an arrangement whereby M. A. Hanna & Co. will act as their selling agents. Also the Arthur Iron Mining Co., a subsidiary organization which controls the operating mines of the Great Northern, has practically completed its organization and is vigorously prosecuting the work which will lead to actual shipments of ore during 1915. However, from these activities the impression should not be permitted to gain ground that the Great Northern trustees will have any vast tonnage of ore to sell in the near future at low prices. In fact, it can be officially stated that the trustees will not permit their agents to make any special effort to sell a large tonnage at present prices. Unless the market improves materially, it is very probable the Great Northern will dispose of only a little ore during 1915. There will be no attempt to overload a top-heavy market and the trustees believe that the present low mining costs will more than outweigh the cost of carrying their ore in stockpiles for one or two seasons. Therefore, those consumers of ore who believe that the entry of the Great Northern into the field means an indefinite prolongation of prevailing prices, coupled with an unlimited supply of merchant ore, are doomed to disappointment.

In addition, the Great Northern properties are not in a position to ship any exceptional tonnage during the coming season. The ore holdings of the Great Northern are indeed vast, but only a small fraction of the tonnage is developed to the shipping point. It is one thing to have over 400,000,000 tons in the ground and quite another thing to be in a position to ship even 1 per cent of it in a season. The largest open pit producers which were operated by the Steel Corporation under the Hill lease, such as the Leonard, North and South Uno, Dale, etc., have been, to a great extent, mined out to the point where steam shovel operations on a large scale are no longer profitable. These properties still contain large bodies of ore, but they will have to be reclaimed by scramming, milling, underground mining and other slower methods. It is to remedy this condition that the Great Northern is developing the large new Dunwoody and Hill Annex pits. The Hill Annex will not be in shape to ship at all in 1915 and the Dunwoody only a fraction of its eventual annual tonnage.

Therefore, as far as 1915 is concerned, the Great Northern trustees would not be in a position to deluge the ore market, even if they were inclined to do so. They will have probably 2,500,000 tons available, a large proportion of which will remain in stockpiles, or in the open pits, unless the price of ore shows more strength than is now indicated.

A Business Man's Return

IN THE big armory at Cleveland this afternoon, a great crowd will extend a hearty welcome to one they love. Thousands of men, rich and poor, native Americans and adopted citizens from other lands will meet to greet whom—a great general returned from the field of bloodshed? No, a plain citizen, a business man, one whose business has heart in it—Myron T. Herrick, who has come home after serving his country, the greatest republic of the New World, at the capital of the greatest republic of the Old World.

This plain business man was attracted by the offer of the ambassadorship to France not only by the glamor of the foreign court, but because it gave him a chance to study the methods in vogue in that country for helping the farmer to borrow money at reasonable rates. He never could understand why American farmers should not be enabled to finance their operations as other business men do. He carried out his plans for this study and was ready to come home.

Then the war was declared and Myron T. Herrick remained at his post. His duties were multiplied. He cared not only for thousands of his own countrymen with untiring energy and finest courtesy, but also assumed the responsibility of representing diplomatically the

THE OPEN HEARTH

great nations at war. He worked early and late for all who needed his assistance.

The big guns of Germany thundered at the very doors of Paris and bombs dropped near the embassy. Other diplomats fled to Bordeaux, but the American ambassador remained at Paris until his government found it convenient to relieve him. Richly has he earned the plaudits of his countrymen and the people of his home city honor themselves in honoring him.

Myron Herrick may be called to even higher service, and if it should be to the highest office in the land, his would be a business-like administration—business-like and at the same time in sympathy with the aspirations of the humblest citizens, for he has been dealing with common folks all his life and they trust him.

Moving in the Right Direction

AFTER three and a half years of steady effort, characterized by many disappointments and discouragements, the boiler specifications committee of the American Society of Mechanical Engineers now is in a position to complete what is the most far-reaching effort ever made in this country to secure the elimination of boiler explosions and the consequent loss of life and property. The committee has drafted a model engineers' and firemen's license law, a model boiler inspection law and a standard code of boiler rules. The model engineers' and firemen's license law, and the boiler inspection law are in shape to be submitted at the 1915 spring meeting of the society. The code of boiler rules, including complete specifications for the manufacture, operation and inspection of boilers, as a result of the harmonizing of the views of the various conflicting interests which were represented at the convention last week, shortly will be put in its final shape.

There does not appear to be any doubt that the code of boiler rules as drafted by the committee will be accepted by the society when the committee makes its final report next spring. There is doubt, however, as to whether the society will give its approval to the model engineers' and firemen's license law, and the model boiler inspection law. A large number of the members of the society have expressed themselves as being opposed to any attempt on the part of that organization to influence or propose legislation. In view of the strong opposition which attended the drafting of the boiler code, and the harmony of views which now has grown out of the original discord in regard to the code, it is possible that opinions as to approving the model laws also may change favorably. It is to be hoped that these laws will be accepted as the voice of the society, since in that case they undoubtedly will result in securing greater uniformity in the boiler laws of the various states than at present prevails. The proposed enactments are based largely on the boiler laws in force in Ohio and Massachusetts, which generally are conceded to be the best boiler laws in existence.

Its First Report

THE first annual report of the United States Commission on Industrial Relations, from which liberal extracts are made elsewhere in this issue, impresses one favorably on account of the evident determination of the members not to rush to conclusions.

This commission did not at first command the confidence of the open shop interests, but the action of the National Association of Manufacturers, the National Metal Trades Association, the National Founders' Association, the National Council for Industrial Defense, and the National Erectors' Association in organizing a joint committee for the purpose of having the open shop interests of the country represented at the hearings and of assisting the commission in its work proved wise and helpful. Walter Drew, the able counsel for the joint committee, has rendered services of a high order and the effect of his work is, we believe, apparent in the conservative character of the report which has just been submitted to Congress. The commission announces that it expects to continue its investigations and, with the co-operation of the open shop organizations, it should accomplish much.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for December 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for Nov., 1914.	Average for Sept., 1914.	Average for Dec., 1913.
Bessemer pig iron, Pittsburgh..	$14.70	$14.70	$14.90	$15.90
Basic pig iron, Pittsburgh.....	13.45	13.45	13.90	13.71
No. 2 Fdy. pig iron, Pittsburgh	13.70	13.70	13.80	14.36
Northern No. 2 Fdy., Chgo....	13.00	13.00	13.50	14.50
Lake Superior Charcoal, Chgo..	15.75	15.75	15.75	15.50
Malleable, Bessemer, Chicago...	13.00	13.00	13.50	14.50
Southern No. 2, Birmingham...	9.75	10.00	10.00	10.75
Southern Ohio No. 2, Ironton..	12.75	13.00	13.00	13.50
Basic, eastern Pa.....	13.50	13.50	14.00	14.25
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.75
No. 2X Foundry, Philadelphia..	14.25	14.25	14.75	15.00
Ferro mang., Balti.....	68.00	68.00	80.00	47.00
Billets, Pbgh.	19.00	19.00	21.00	20.00
Sheet bars, Pbgh.....	19.50	19.62	22.00	21.00
Steel bars, Chicago.....	1.25	1.25	1.38	1.38
Steel bars, Pittsburgh.....	1.05	1.10	1.20	1.31
Iron bars, Philadelphia.....	1.15	1.15	1.17	1.27
Iron bars, Cleveland, local del'y.	1.15	1.20	1.20	1.30
Iron bars, Chgo. mill.....	.95	.975	1.07	1.15

	Today's prices.	Average for Nov., 1914.	Average for Sept., 1914.	Average for Dec., 1913.
Beams, Chicago	$1.25	$1.25	$1.38	$1.38
Beams, Pittsburgh	1.05	1.11	1.20	1.25
Beams, Philadelphia	1.25	1.25	1.30	1.35
Tank plates, Pittsburgh.....	1.05	1.09	1.18	1.18
Tank plates, Chicago.....	1.25	1.25	1.38	1.33
Tank plates, Philadelphia.....	1.25	1.25	1.30	1.40
Sheets, blk., No. 28, Pittsburgh	1.80	1.89	1.95	1.88
Sheets, blue an., No. 10, Pbgh.	1.35	1.39	1.40	1.40
Sheets, galv., No. 28, Pbgh....	2.80	2.86	2.95	2.87
Wire nails, Pittsburgh.....	1.50	1.59	1.55	1.55
Connellsville fur. coke contr....	1.70	1.65	1.75	1.81
Connellsville fdy. coke, contr...	2.25	2.25	2.35	2.54
Heavy melting steel, Pbgh.....	10.25	10.06	11.44	11.00
Heavy melting steel, east'n Pa.	9.50	9.50	10.50	10.00
Heavy melting steel, Chgo.....	8.00	8.25	9.37	9.00
No. 1 wrought eastern Pa.....	11.50	11.00	12.50	13.00
No. 1 wrought, Chgo.....	7.50	7.50	8.31	8.50
Rerolling rails, Chgo.....	9.50	9.50	10.87	11.50
Car wheels, Chgo.....	10.00	10.00	10.75	12.25

(For Additional Prices See Page 1110.)

Big Tonnage Sold at Pittsburgh

And Some Sellers Have Advanced Quotations—Activity Continues in Some Sections—Decreases in Others

Pittsburgh, Dec. 8.—Sales of pig iron in this district the last fortnight involve 100,000 tons. The Standard Sanitary Mfg. Co., the end of last week, closed for 24,000 tons of northern and southern foundry grades for equal shipment the first half of the year to plants at Pittsburgh, New Brighton, Pa., and Louisville, Ky. Iron for plants in this district, involving 16,000 tons, was obtained on the basis of from $13.50 to $13.95, Pittsburgh, for No. 2, and the southern iron was purchased at $9.50 and $9.75, Birmingham, for No. 2, and $9, Birmingham, for No. 3, indicating that No. 2 is quotable at a spread from $9.50 to $9.75, Birmingham. The Iron City Sanitary Mfg. Co., two Johnstown radiator interests and several melters in this vicinity have taken not less than 20,000 tons of foundry grades since the buying movement began. The American Steel Foundries, which bought 15,000 tons of standard basic a fortnight ago, has since taken 7,500 tons, making purchases aggregate 22,500 tons. The current price, $12.50, valley, was paid for the last lot. Bessemer remains quiet. Small lots are being sold at a spread from $13.75 to $14, valley. At least one important seller is asking $13.50, valley, for foundry, or 75 cents a ton above the recent minimum quotation.

Active Buying Extends

Philadelphia, Dec. 7.—More active buying of pig iron recently in this territory, expanded further during the past week and the turnover in that period was not less than 50,000 tons. This total includes both iron purchased by consumers in this terrtory from nearby furnaces and that booked by sellers here for delivery in other districts. As the result of the continued activity of the market, some sellers are more conservative in taking on orders for forward deliveries at present low prices, but there has been no actual change in the quotable market. Low phosphorus iron has been in good demand, and transactions reaching 12,000 to 15,000 tons were closed the past week by eastern Pennsylvania and New York state makers. Some of this iron was for all next year delivery, which commanded 50 cents to $1 a ton over first quarter or half. For standard iron the movement was done at $19 to $20, Philadelphia basis, and for Lebanon brands at $16 to $16.50, furnace. The Edgar Allen Manganese Steel Co. bought 3,000 to 4,000 tons for two plants and the General Electric Co. was a purchaser. The Midvale Steel Co. has not closed on its inquiry for 3,000 to 4,000 tons. In basic, a Philadelphia steel maker is inquiring for 3,000 tons for first half and is known to have been quoted $13.50, delivered, while a lower figure is rumored. It develops that a recent quiet sale of basic in this district, previously referred to, amounted to 3,000 tons and one report has it that $13.25, delivered, was done, though this is not confirmed. Other sales in the week include 4,000 tons of foundry and malleable grades to the Norfolk & Western railroad for first half which went to Virginia, Ohio and other makers; 5,000 to 10,000 tons of No. 2 plain to the National Radiator Co., principally for Johnstown, Pa., but including 2,000 tons or more for Trenton, N. J., this business in part going to eastern and Central Pennsylvania makers; 1,000 to 1,500 tons of No. 2 plain to a Salem, N. J., buyer; 2,500 tons to two New England buyers closed mainly with central Pennsylvania furnaces; about 1,000 tons of Alabama iron to a Lynchburg, N. J., consumer; 3,000 to 4,000 tons of northern grades to cast iron pipe makers in this district; 600 tons of eastern Pennsylvania foundry to Reading, 350 tons of Alabama iron to Baltimore and numerous smaller lots. A Virginia furnace reports having booked 6,000 tons of orders since Dec. 1, the largest order

(*For complete prices see page* 1110)

being about 1,000 tons. The United States Cast Iron Pipe & Foundry Co., after having purchased a considerable tonnage, still is negotiating. Details of its purchases are unknown, but it is understood it has taken no very heavy tonnages of southern iron as yet. Foundry prices remain at $14.25 to $14.50, Philadelphia, for northern No. 2X and at $12.25 to $12.75, furnace, for Virginia No. 2X. Central Pennslyvania makers hold more firmly to $13, furnace, minimum for No. 2X. One of the Thropp furnaces in central Pennsylvania will go in this month.

Heavy Buying.

St. Louis, Dec. 7.—The largest buying movement in pig iron that St. Louis has experienced for a long time took place last week, when upwards of 20,000 tons of iron—Southern No. 2, charcoal, malleable and other grades changed hands, and inquiries are now in the market for 10,000 to 20,000 tons of basic for one concern, and one for 1,500 to 2,000 tons of malleable.

Prices of $9.50 to $10 for Southern No. 2 prevailed, which may have been the cause of so much buying, but local agents are of the opinion that the bottom has been reached in prices.

Northern iron is quoted at $13, Ironton, and $13, Chicago furnaces.

Market Quiet Again.

Cincinnati, Dec. 7.—Sales and inquiries have lapsed considerably and the present week has not been as good as the two previous. Prices are at the same level to which they declined two weeks ago, but the tendency is to advance slightly again, now that the buying movement is about over. Southern No. 2 foundry iron is still obtainable at $9.50, Birmingham basis, for shipment into the first half, though the majority of quotations are from $9.75 to $10, Birmingham basis, for this grade, with the higher price prevailing. Southern Ohio No. 2 foundry iron is firm at $12.75, Ironton basis, and offers of business at $12.50 and even $12.65 have been refused by the furnaces. The month of November was the best in the pig iron market during the year and more iron was sold than during any November of the past seven or eight years. This buying movement is attributed to the fact that most melters needed iron and when furnaces began to cut prices, they immediately took advantage of the situation. It is therefore not expected that much iron will be sold during December, as most of the large buyers have covered until well into the first half.

Dull at Birmingham

Birmingham, Ala., Dec. 7.—There is no improvement in the Birmingham pig iron market, except for one or two comparatively large inquiries during the past week. The placing of a large order in this district by The United States Cast Iron Pipe & Foundry Co., reported in several places during the past few days, has not been confirmed, although that company has placed an inquiry with some Birmingham makers. Small sales of iron, as has been the rule for some time, are being closed. No. 2 foundry is being sold on fairly large orders at $9.75, although $10 is the prevailing quotation. One large pig iron maker admits that a "real" inquiry, by which he said he meant one for a good tonnage, would shade the $10 quotation fully 50 cents.

The reported improvement in business conditions in other sections of the country so far has not been felt in the south, owing probably to the cotton situation, and iron interests are by no means optimistic as to the proximity of improvement here. Large sales of southern iron reported from New York, Cincinnati and similar points, fail of confirmation here.

Inquiry Still Active

Chicago, Dec. 8.—Considerable buying of pig iron is taking place during the present movement, inquiry continues active and new prospective buyers are entering the market daily. Estimates as to the total sales of pig iron in this district vary widely, but it is believed close to 200,000 tons have been disposed of since activity began, approximately two weeks ago.

A number of features have prevented the tonnage running as high as might have been expected and the advance in price has not yet taken place. Northern No. 2 foundry is still firm at $13, Chicago furnace.

One feature which is a drag on the market is almost entire absence of malleable iron melters from the present inquiry. Lack of activity on the part of railroads, which take the largest portion of the output of malleable foundries, is the cause back of this. Another unfavorable feature is the conservatism of buyers and as a general thing they are taking 50 to 75 per cent of their normal requirements for first quarter and first half. Still another drawback is the fact that many melters have iron still undelivered from furnace and under these circumstances are not entering the market to buy in a speculative way, even at the attractive prices now ruling.

Although only three merchant stacks are blowing of the 12 situated in northwestern territory, no movement has been made, on the strength of present sales, to blow in any of those not now operating.

A few representative sales only indicative of the general movement may be cited. A sewing machine maker in Illinois has taken 1,500 tons of northern No. 2 foundry, 1,500 tons of high silicon and 500 tons of southern foundry. A Chicago maker of sanitary appliances has closed for 1,200 tons of southern iron and a considerably larger tonnage of northern. A Chicago foundry has taken 2,000 tons of No. 2 northern foundry. A maker of foundry equipment just over the line in Indiana has closed for 1,000 tons of northern and a maker of stoves in Chicago has bought an equal tonnage of southern.

Sellers find that stove manufacturers and sanitary appliance makers have bought rather more freely than other melters, although inquiry and sales have been widely scattered over the entire market with the possible exception of agricultural implement makers and malleable foundries.

While sales of southern iron have not been for large tonnages, a considerable number of contracts have been made and as low as $9.75, Birmingham, has been done on No. 2 foundry in numerous instances, with rumors difficult to verify that $9.50, Birmingham, has been available here and there.

Lake Superior charcoal iron is steady on a basis of $14.75, Chicago, for No. 2 and No. 3, $16.25 for Nos. 1, 4 and 5, and $16.75 for No. 6 and Scotch. While three charcoal stacks are at present in operation, at Newberry, Elk Rapids and Boyne City, Mich., it is believed only two will operate through the winter, thus further curtailing the output and tending to strengthen the market for this specialty.

Fair sales in New York

New York, Dec. 8.—Buying of pig iron in the metropolitan and surrounding districts the past week has been of smaller volume of the whole as compared with other recent weeks, but a considerable tonnage was booked. Inquiry by various classes of consumers is more active, but outside of New England, where the machinery builders undoubtedly are enjoying a heavier melt, there are no trustworthy signs of increased consumption. Alabama makers have been closing more tonnage with buyers in New England and in this center, some of the latter being for shipment to outside districts. Recent sales of southern iron made here aggregate about 15,000 tons. A Granite City, Ill., steel maker

(*For complete prices see page* 1110)

who had inquired for 2,000 to 3,000 tons of northern basic, bought about 10,000 tons of Alabama basic, instead. Reports are current that one Alabama seller has been offering iron in New England at considerably under $9.75, Birmingham, for No. 2, and has sold a considerable tonnage. A Bristol, Conn., buyer has closed for about 2,500 tons of regular foundry and high phosphorus grades for first half. An inquiry for 1,500 tons of foundry iron for western delivery, is current. Virginia makers have been selling more actively for first half at $12.50 and $12.75, furnace, for No. 2X. Prices under $12.50, furnace, recently offered for prompt shipment, are less in evidence. Buffalo makers appear to be holding to their schedules of $13, minimum. A number of sales of low phosphorus are being made in this territory, including one of 400 tons.

A New Britain hardware manufacturer bought 500 tons of foundry and a sale of equal amount was made in this immediate district. The tidewater market shows more firmness around $14.25 for No. 2X.

Prices Firm at Buffalo

Buffalo, Dec. 8.—Furnaces of the Buffalo district are adhering to the advances in prices announced with the advent of the heavy buying movement of several weeks ago. With a single exception, and that is a producing interest just outside of the Buffalo territory, no booking has been done at less than $13, f. o. b. furnaces, for foundry grades of iron. The interest proving the exception to this attitude has sold several thousand tons at a figure slightly under the present market, but higher than the bottom level which prevailed several weeks ago, when more than 150,000 tons was booked.

The capacity of about all of the producing interests of the district is now taken up until the end of the first quarter of 1915. The furnaces generally in the Buffalo zone entered only small lot orders for the week. It is reported that the demand for iron under contract has been such in the past few weeks as to clean up the yard stocks of the furnaces.

While there has been a falling off from the volume of sales previously recorded in this territory, the producers are confident of a return of the buying movement shortly after the opening of the new year, but no business of any great extent is looked for until after the foundries of the district and those that buy in the Buffalo market are past the inventory period. Basic in this territory is now being quoted at $13.50 flat, and No. 1 foundry at $13.25 to $13.50, with $13 to $13.25 the schedule on No. 2X foundry.

Prices Advanced.

Cleveland, Dec. 8.—Sellers in the Cleveland district report some decrease in inquiries as compared with the preceding two weeks, but there is a moderate amount of buying and prices are firmer. One firm which sold 2,500 tons to a sanitary interest at $13 valley has advanced its quotation to $13.50 and has made sales at that price. This quotation is, of course, shaded by other sellers, but the very low recent quotations are rapidly disappearing.

Steel Barrels Ordered

For Export to Russia—Considerable Cutting in Prices of Sheets

New York, Dec. 8.—An inquiry for 50,000 steel barrels or casks for Russia, which has been current in this country for several months, has been partially satisfied by the award of 25,000 barrels to an eastern manufacturer. These barrels are of 55 gallons capacity and are manufactured of No. 18 gage galvanized sheets. They are to be used for the carriage of gasoline for the Russian army. A similar award was recently made to a Cleveland barrel manufacturer.

Light Market In East

Philadelphia, Dec. 7.—A hand to mouth market in sheets which recently has prevailed in this territory shows no improvement. Buying is on a meager scale and is made to cover only such requirements as the work on hand calls for. Consumers have offered to contract, in some cases, for forward periods at todays prices, but eastern makers are unwilling to book themselves ahead at the prevailing quotation of 1.50c, Philadelphia, or 1.35c, Pittsburgh, for No. 10 gage blue annealed. Where sizeable orders have come up, this figure has been shaded.

Sheets More Active, But Irregular

Pittsburgh, Dec. 8.—Steel sheet makers in western Pennsylvania and eastern Ohio advise that there has been a moderate improvement in activity the last 10 days, but material continues to be sold at rather low figures, especially for immediate shipment. Leading makers are asking 1.35c, 1.85c and 2.85c for base size blue annealed, black and galvanized sheet products, respectively, and those figures are being obtained for forward delivery, although shading in isolated cases is reported. Manufacturers do not expect much change in the situation until after Jan. 1.

Sheets Show Weakness

Chicago, Dec. 8.—Prices on steel sheets have softened somewhat in the past week and No. 28 gage black and galvanized are now quotable on a basis of 2.04c and 2.99c, Chicago mill, respectively, while some tonnage is being taken at $1 per ton higher when specifications are not so attractive. For delivery during first quarter makers are quoting $1 per ton higher and are unwilling to make quotations beyond April 1.

As usual in a market characterized by extremely low figures, rumors are rife that tonnages are being taken here and there at a material shading of the ruling quotation and in the present state of hunger for tonnage to complete the year, more or less reliance can be put on these rumors.

Low Quotations.

Cleveland, Dec. 8.—The sheet market is weak and some very low quotations are being made: namely, 1.30c, Pittsburgh, on No. 10 blue annealed, 1.80c on No. 28 black and 2.80c on No. 28 galvanized. The demand is only moderate, but some makers believe that a heavy buying movement to replenish stock will soon be started.

Specifications Good

Cincinnati, Dec. 7. — Specifications on contracts are good and in most cases satisfactory. New business is varied, being good one day and poor the next, but the average is about the same as that of the past four or five weeks. Rumors of lower prices in surrounding territories are heard, but cannot be verified here and the prevailing quotations are 2.058c for black sheets No. 28 gage and 3.058c for galvanized No. 28 gage, both Cincinnati basis.

The Security Steel & Iron Co., dealer in scrap iron and steel at Green Island, N. Y., has filed a petition in bankruptcy with liabilities of $173,483 and assets of $2,541. Harry E. Clinton, president of the company, signed the petition under which all suits against the bankrupt have been restrained.

(*For complete prices see page* 1110)

Railroads Buying Bars

Two Lines Place Orders—Implement Manufacturers Specify Slowly—Some Price Cutting

Philadelphia, Dec. 7.—Several of the railroads now are coming into the market in this district for their forward bars. The Chesapeake & Ohio railroad has closed for 1,500 tons with middle western makers and is reported to have shaded 1.10c, Pittsburgh. The Norfolk & Western railroad asks 1,000 tons for first half. The Baltimore & Ohio railroad is out for a small quantity of special bars. These negotiations with several other inquiries from various consumers have produced more stir in the market, but there is no appreciable change in specifications. Eastern Pennsylvania implement manufacturers are ordering out steel slowly. A Scranton axle manufacturer has taken a large order for axles for motor trucks to be exported by the Studebaker Corporation, but the bars are covered by a recent requirement contract of this consumer. The steel bar market has been 1.25c, Philadelphia, but this probably now could be shaded on a desirable order.

Steel Bars Move Better

Chicago, Dec. 8.—Users of steel bars in the west, particularly agricultural implement makers, are taking somewhat more of their tonnages and steel bars are moving more readily than has been the case recently. It appears that agricultural implement makers have liquidated their stocks of raw material and from now on are expected to specify on their contracts to cover whatever output they manufacture. The schedule of operation for this department is somewhat heavier than last month and one group of factories has gone from four days a week to a six-day schedule. Others have increased somewhat, but in some instances greater activity has not become evident.

Bars are obtainable readily at 1.24c, Chicago, with particularly attractive tonnages available at 1.19c for immediate delivery in Chicago.

The finished steel market as a whole feels an uplift as to prospects and a slight increase in tonnage on books, while prices are still at a low level where they must remain until a considerably heavier buying movement is evident.

Ready to Contract

New York, Dec. 8.—Some buyers of steel bars in this territory continue to manifest more willingness to make contracts covering their first quarter and first half requirements. The mills, however, are not going out of their way to develop such business at ruling prices and are endeavoring to hold sales to prompt and early needs. The market shows no appreciable expansion in specifications. Prices seem fairly steady at 1.26c, New York, or 1.10c, Pittsburgh, though occasional reports of shading of this figure come out.

Increase in Orders

Buffalo, Dec. 8.—The mills and agencies of the Buffalo district report an increase in the volume of orders in bars, shapes and plates in the past few days. There is a disposition on the part of the sellers to limit buying to needs up to April 1, 1915, but some business has been booked for second quarter of the new year at an advance of $1 a ton over the first quarter quotations. Like the pig iron interests, the mills and agencies are looking for an improvement in the general situation to set in after the turn of the year. For fourth quarter needs, the prevailing price is 1.10c, base, on favorable lots and for less carloads a price of 1.15c, base, is being asked on bars, shapes and plates.

Improvement Expected.

Cleveland, Dec. 8.—The bar market is quiet; some contracting is being done at 1.10c up to April 1. The general expectation is that the market will improve shortly after Jan. 1.

Iron Bars Still Slow

Chicago, Dec. 8.—Makers of bar iron in the Chicago district find conditions essentially unchanged and while the leading maker continues to operate its mill on full time, smaller concerns have lost entire weeks through the past three months. Probably not more than 30 per cent of capacity is in operation in this vicinity. While rumors have been heard of bar iron being sold at 0.90c, it is difficult to verify and the quotation apparently is more nearly represented at 0.95c, some tonnages being taken as high as 1.00c. Even at this price, the cost of scrap is too high to allow much profit and makers are not willing to obligate themselves for future delivery.

Business Light

New York, Dec. 8.—Common iron bars continue to be sold at New York at the range of 1.12 to 1.15c, delivered, depending upon the size of the order. Business is light, some mills in this vicinity running at only about 30 per cent of capacity.

(*For complete prices see page* 1110)

Billet Exports

Are Still Prevented by the Very High Ocean Freight Rates

Philadelphia, Dec. 7.—Scarcity of bottoms and the high ocean freight rates continue to block the development of export business in semi-finished steel by sellers in this district, notwithstanding the fact that some offers are being made by foreign buyers which under more normal circumstances would be considered favorable. Rates on steel now being quoted from Atlantic ports to Scotch or English ports range from $7 to $8 a ton or 28 to 32 shillings, including war risks, insurance, etc. Before the war, they were 12½ to 15s. Since the early weeks of the war, the rates have gone up about 100 per cent. Under these conditions, offers by British buyers of better than $25, delivered at port, there being no response and continued inquiries for billets, sheets, bars, slabs, etc., are attracting small attention in this district. Even at an ocean freight of $5 a ton, merchants state they could do considerable business with the mills which have been quoting from about $19.25 to $19.75, seaboard. Home buyers are putting forth little demand for semi-finished steel and the market is very dull. Prices rule from $22.40 to $22.90, Philadelphia, or $19 to $19.50, Pittsburgh.

Semi-Finished Weak

Pittsburgh, Dec. 8.—The market for semi-finished steel products in the Greater Pittsburgh district is unsatisfactory. There has been no buying of consequence, and indications are that manufacturers in need of tonnages would sell at decidedly low figures, for immediate shipment. It generally is conceded that billets are quotable at a spread from $18.50 to $19, and sheet bars from $19 to $19.50, maker's mill, for prompt delivery; some makers, however, advise that they would not sell at less than maximum quotations. Wire rods, nominally quoted at $26, are obtainable at $25, Pittsburgh, and possibly less.

The Pittsburgh Emery Wheel Co., Pittsburgh, manufacturer of emery, electrolite, incordite and borundum grinding wheels, announces the removal of its office from the Park building, Pittsburgh, to its plant at Rochester, Pa.

Scrap Improves Slightly

In Some Districts—Quiet Buying by Dealers for Speculation in the East

Philadelphia, Dec. 7.—Some betterment is apparent in the eastern Pennsylvania scrap market, though the change is not pronounced. Consumers are giving closer attention to the present low prices and there is less disposition to sell among dealers and merchants. Some quiet buying by dealers for speculation is reported. For heavy melting steel, $9.50 delivered eastern Pennsylvania is minimum and several mills are offering this figure. A steel maker is inquiring for low phosphorus crop ends, which are scarce. Offers of $14, delivered, for shafting are out from buyers. There is a greater taking of cast scrap by the cast iron pipe and other foundries. November lists just closed by the railroads brought about the same average prices as for October, indicating that the steady decline in prices has about spent itself.

Steel Scrap Looks Upward

Pittsburgh, Dec. 3.—The iron and steel market continues to look upward, although buying is still limited to small lots. Heavy melting steel is being held at $11.75, or 75 cents a ton above the figure at which this grade was sold a short time ago. Other grades reflect moderate strength but middlemen do not expect to witness much activity until after the finishing mills increase outputs. More important consumers have heavy stocks in their yards. Some of the heavy melting steel sold this month by the Pennsylvania railroad brought as high as $11.85.

Prices Advance.

St. Louis, Dec. 7.—Nearly all scrap prices are up and the market is very strong with a tendency to further advance. Lists out today are: Baltimore & Ohio Railroad, 14,000; Southern Railroad, 8,000 tons; Mobile & Ohio, 1,000 tons; Vandalia, 700 tons; Wabash, 1,000 tons; C. & E. I., 300 tons; Terminal Association, 600 tons; Kansas City Southern, 300 tons.

Melt is Heavier.

Cincinnati, Dec. 7.—The consumption of scrap has undoubtedly improved during the past month, but it has not as yet reached sufficient proportions to have any effect upon the market. Foundries making castings for machine tool plants are buying more frequently, but are still pursuing the hand to mouth policy of taking small lots when actually needed. Rolling mills are melting about the usual amount. Railroads are offering large lists and the large surplus available in dealers' yards and throughout the rural districts makes an advance in prices almost an impossibility. Quotations are unchanged on all materials but are uncertain because of dealers quoting on each sale independent of others.

Scrap Prices Firm

Chicago, Dec. 8.—An effort by sellers of iron and steel scrap in Chicago to advance prices has not yet borne fruit, due to the almost entire absence of buying and to the short schedule on which mills are operating. Whether holders of large accumulations will be able to force consumers to pay a higher price remains to be seen, but the effect of the effort is to make quotations firmer, although no actual advances have taken place. Deliveries of railroad scrap bought within the past two or three weeks will begin shortly and a test of the market will result. The Wabash railway is offering 1,300 tons, the Illinois Central 2,700 tons, the Southern railway 3,300 tons, the C., St. M. & O. 3,000 tons, the B. & O. 300 tons, the Minneapolis, St. Paul & Sault Ste. Marie 1,200 tons and the Kansas City Southern 350 tons.

Price Stiffens

Cleveland, Dec. 9.—Some fairly good tonnages of heavy melting steel have been sold to valley consumers and the price has stiffened in consequence. As most of this tonnage is for consumption within a short time, it is expected needs for the next two months have been covered. Dealers in this city are feeling better as to market conditions generally and look for activity within a reasonable time. Borings and turnings are in little demand. Generally prices have not changed.

More Definite Prices

Buffalo, Dec. 8.—The scrap dealers of the Buffalo district are beginning to experience enough trading to re-establish more or less definite schedules on the different lines. Previously trading was so light that prices were but nominal. The disposition of the dealers is to stiffen in prices, as they are looking for a more favorable demand to develop with the turn of the year, which will have a bearing on the price question. So far, the buying has not been very extensive, with the exception of the sale last week of the large tonnage of scrap by the Erie railroad. Heavy melting steel is being quoted at $9.50 to $10 per gross ton; No. 1 railroad wrought scrap at the same; No. 1 machine cast scrap at $10 to $10.50; railroad malleable at $9 to $9.50; old steel axles at $11.50 to $12; locomotive grate bars at $8.50 to $9; clean cast borings, $5.50 to $6.25; and heavy axle turnings at $8 to $8.50.

(*For complete prices see page* 1110)

Quiet in the East

New York, Dec. 8.—The scrap market remains very quiet in the metropolitan district, though the undertone seems better. Sellers find difficulty in obtaining offers from consumers at which they can do business. The sellers, however, are more independent in accepting prices recently ruling, except on such lots as they wish to move and have on hand. There is very little speculation at present. Prices are more staple and no further declines are to be noted.

Wire Makers

Unable to Prevent Shading of Announced Quotations

Pittsburgh, Dec. 8.—Despite several attempts, wire makers have been unable this year to establish the market above the basis of $1.50 a keg for nails, although published quotations have been as high as $1.60. Material for prompt delivery is being freely offered at $1.50 for nails. Wire, demand for which has been augmented by the war, reflects a more satisfactory tone, although plain wire has been offered at $1.30. Belligerent nations continue to figure prominently in the market for barbed wire and wire rods.

Irregularity of Prices.

Cleveland, Dec. 8.—While it is freely conceded that there is considerable irregularity in prices on wire nails and plain wire, the sellers state that the tonnage being sold as low as $1.50 for wire nails and $1.30 for plain wire to jobbers is small. Nearly everybody is covered by contract at least up to Jan. 1. Demand for fence wire is moderate, but that is to be expected at this time of the year.

Bolts, Nuts and Rivets

Pittsburgh, Dec. 8.—The market for nuts, bolts and rivets is quiet, manufacturers report. Nuts and bolts are being offered at rather wide ranges in price, and the rivet market shows irregularity. Structural rivets are named at 1.45c and boiler rivets at 1.55c.

Plate Orders Are Slow

Prospect for Increased Demand by Some Consumers Causes More Cheerful Feeling

Philadelphia, Dec. 7.—A better outlook for car and shipbuilding remains the basis for a more cheerful feeling among plate makers, but increase in current business is painfully slow with eastern mills. Orders are a little more numerous, but the tonnage is modest. The Harlan & Hollingsworth Corporation is credited with having received the contract for a 450-foot steamship for coastwise traffic. Most of the more numerous shipbuilding projects now before the yards in this territory, however, remain in the negotiating stage and awards are awaited. The Norfolk & Western railroad is inquiring for 1,000 tons of plates. Sharp figuring for even small orders in this territory is being done by the mills. On an order for 175 tons for a Carbondale, Pa., consumer, middle western makers bid 1.05c, mill, but lost the order by a considerable margin to an eastern producer. It now is apparent that on an attractive order at least 1.20c, Philadelphia, could be done.

Hot Rolled Still Quiet

Pittsburgh, Dec. 8.—Manufacturers of hot rolled products have received numerous inquiries recently for first quarter delivery, but the market remains dull and inactive so far as actual buying is concerned. Consumers, apparently, do not want to replenish stocks until after the invoice period is passed. While mills are asking 1.10c for forward shipment, yet material is going at 1.05c for prompt delivery, and suggestions are offered that an attractive tonnage could be placed at that level for shipment after Jan. 1. Mill operations remain at low ebb; average operations in this district are between 35 and 40 per cent of capacity.

Plates Show Heaviness

Chicago, Dec. 8.—As has been the case almost throughout the present year, plates have participated somewhat less than other products in the bettered conditions of the finished steel market. Almost entire absence of car buying, coupled with slackness in other departments usually consuming large tonnages of plates, has resulted in exceedingly slack demand and the plate mill capacity in this vicinity is being operated only to a small extent. Plates are quotable at 1.24c to 1.29c, Chicago mill, but some sales have been made at $1 per ton less than this minimum for immediate delivery.

Brisk Store Business

Chicago, Dec. 7.—Warehouse business continues brisk and considerable additions to the volume of sales have been felt recently. One feature which is most notable is the increasing demand for sheet metal which is coming from many sources and is causing a considerable tonnage of this material to move out. Structural business is light as the building season is practically completed but taken as a whole warehouses are on a better basis than for several weeks.

Changeable at Cincinnati

Cincinnati, Dec. 7.—Warehouse business shows no change but is uncertain and fluctuates, being good one day and poor the next. Cold rolled shafting is quoted all the way from 60 to 62 per cent off and steel hoops are still quoted at 1.90c, which is considerably below prices in surrounding territories. Quotations have not changed but show a tendency to do so and they will probably change one way or the other before the first of the year.

Cast Iron Pipe Award

Large Tonnage Offered Detroit Plant of American Car & Foundry Co. at Low Price

Detroit, Dec. 9. (By wire.)—The Board of Water Commissioners tentatively has let the water pipe contract to the American Car & Foundry Co. It carries 25,000 tons and involves approximately $500,000. There were seven bidders. The Warren Foundry & Pipe Co., Phillipsburg, N. J., and the Detroit concern were lowest. In the aggregate, the Warren company's bid was about $11,000 lower than its competitors. As the American company is a local concern, the commissioners will award it the contract, if it will accept the offer of $21.45, which is $700 lower on the total than the Warren company's bid. Much of the pipe used will be 42-inch and 48-inch.

Eastern Market

New York, Dec. 8.—Baltimore has entered the market for cast iron pipe and will take bids Dec. 16 on 7,700 tons of 4 to 60's and specials. The inquiry includes 2,500 tons of 60's, 1,200 tons of 30's, 1,250 tons of 20's and the balance of 4 and 16's. Other municipalities are coming out with their requirements and the market shows some betterment all around, as private buying also is expanding. The Public Service Gas Co. is in the market for 2,000 tons for delivery to various New Jersey points. Newton, Mass., takes bids Dec. 10 on 223 tons of 6 to 12's. Prices seem a little firmer in that recent business placed has brought a better average for the foundries. R. D. Wood & Co. has taken 1,050 tons for New Bedford, Mass., at $19.95, delivered, for the 10's, $19.70 for the 30's, $20.30 for the 6 and 8's and $22.70 for the 4's, the freight being $1.60. The 5,500 tons of 3 to 6's for Dayton, has been taken by the United States Cast Iron Pipe & Foundry Co., New Britain, Conn., will take bids Dec. 16 on 300 tons of 4 to 16's.

Cast Pipe More Active

Chicago, Dec. 8.—A somewhat more active market exists for cast iron pipe in the west and requirements of municipalities for next year's business are being figured. The letting at Detroit, which will involve 25,400 tons, probably will be completed this week. Council Bluffs, Ia., will open bids Dec. 14 on 500 tons, and Cuba, Ill., opened bids Dec. 9 on 450 tons. The United States Cast Iron Pipe & Foundry Co. has been awarded 500 tons for the city of Dayton, O. Neoga, Ill., has awarded 150 tons to a contractor who has not yet placed the tonnage with a maker.

Awards New Plant Contracts

Construction contracts have been placed by the Bethlehem Steel Co. for the new fuse plant to be erected at New Castle, Del., in connection with the company's activities in the manufacture of ammunition. The new plant will consist of nine buildings, including a magazine, a charging plant, 36 x 80 feet; an office building, 32 x 45 feet; a power house, 96 x 80 feet; two shops, 102 x 27 feet each; two shops, 82 x 27 feet each, and one other small structure.

Moses Lehman, president of the Blaw Steel Construction Co., Hoboken, Pa., died suddenly at his home Nov. 25.

(*For complete prices see page* 1110)

Bridge Builders Sail

Will Look Into Chances of Selling Shapes for Reconstruction in France

New York, Dec. 8.—The invitation of the French government to various bridge builders in this country to send their representatives to look over the ground there preliminary to the reconstruction of bridges and other works destroyed, as previously reported in THE IRON TRADE REVIEW, is being taken advantage of by some companies. Representatives of the Lackawanna Steel Co., of the Holbrook, Cabot & Rollins Corporation, New York, and of other New York contractors, sailed for France, Dec. 5, to look into this matter. Other bridge shops are interesting themselves in the proposition, but are waiting the issuance of more definite plans. The manner in which the financing of this reconstruction work will be carried out, undoubtedly will have a considerable bearing upon the effort which American shops will make for this business. English shops are expected to make a strong bid for this business. It is believed these preliminary inquiries by the French government are being made at this time in order that the reconstruction work may be pushed without delay, once the circumstances permit a forward movement of the army.

There is no substantial improvement in the structural market in this district. Inquiries continue small and are not very numerous. Little hope is expressed by fabricators for much change in the situation before Jan. 1. Plain material prices are weak and some aggressive sellers are more disposed to quote 1.21c, New York, or 1.05c, Pittsburgh. The present range of prices is 1.21c to 1.26c, New York.

Structurals in Demand

Chicago, Dec. 8.—Considerable increase in demand for structural shapes is apparent and a number of projects that have been hanging fire are coming closer to the market. Bids have been taken on about 3,500 tons for the second section of the Morrison hotel, Chicago, and it is expected bids will be taken shortly on 4,000 tons for a building for the W. W. Kimball Co. and 6,000 tons for an office building for Lyon & Healy, both projects being in the downtown district of Chicago. Rebuilding of the Stratford hotel in Chicago is held up by the refusal of the city council to allow it to go beyond the height limit set a couple of years ago. With this removed, a considerable tonnage would be before the market.

While structurals are quoted at 1.24c to 1.29c, Chicago, it is believed a large tonnage would command a lower price at present.

Building in Cleveland

Cleveland, Dec. 8.—Building operations in Cleveland to Dec. 1 this year exceeded the figures for the same period last year by $4,222,855, the total for 11 months this year being $26,092,235. An item which swelled the November figures was a permit for the interior work at the new city hall, which will cost about $1,000,000. Permits were issued last month for 843 structures totalling $2,153,645, but the buildings calling for any considerable quantity of steel were few. The only large structure pending in northern Ohio at present is the new Willys-Overland plant at Toledo, calling for about 1,500 tons of shapes, which it is expected will be awarded within a few days.

Quiet at Pittsburgh

Pittsburgh, Dec. 8.—Fabricators in western Pennsylvania continue to complain about inactivity, and no contracts of importance have been announced this week. Fabricating material, as indicated elsewhere by THE IRON TRADE REVIEW, is selling at low prices, although no activity of consequence is reported.

Low Prices at Philadelphia

Philadelphia, Dec. 7.—Some set-back of the more hopeful feeling among eastern makers of structural shapes was sustained the past week by the very light bookings and the more open appearance of lower prices in this district as the result of more aggressive selling efforts by some of the larger mills. A price of 1.20c, Philadelphia, or 1.05c, Pittsburgh, came into evidence more generally in the week, though very little tonnage was at stake, and this figure now fully dominates the market. While this price previously had been given in a few cases, it was by no means as freely named, as now is being done. Future prospects for shape business still appear better, though immediate requirements are small.

CONTRACTS AWARDED.

Union passenger station, Burlington, Vt., 250 tons, awarded American Bridge Co.

Dry docks for United States government at Pearl Harbor, Hawaii, 3,400 tons, awarded to the American Bridge Co.

Bridge for Boston & Albany railroad at Boston, 200 tons, awarded American Bridge Co.

Apartment at 160th street and Park avenue, New York City, 400 tons, awarded Park Iron Works.

Ida Noyes Hall for the University of Chicago, 770 tons, to Morava Construction Co.

United States government, post office at San Francisco, 335 tons, to Pacific Rolling Mill Co.

Fort Dodge, Des Moines & Southern Ry. Co., three 96-foot deck girder spans, near Boone, Ia., 176 tons, to American Bridge Co.

Iola Sanitorium, Rochester, 250 tons, contract for steel to F. L. Heughs Co., Rochester, by R. T. Fuller Co., Rochester, the general contractors.

Cornell University, drill hall, 1,200 tons Seneca Engineering Co., Montour Falls, N. Y., sublet contract for steel to three different fabricators.

CONTRACTS PENDING.

Fuse factory for the Bethlehem Steel Co. at New Castle, Del., 125 tons, bids being taken.

Pier and bulkhead, North River, New York City, for Lehigh Valley railroad, 800 tons, bids being taken.

Steel pier, New Bedford, Mass., 1,000 to 1,200 tons, bids being taken by the Commonwealth.

Arcade building for the Standard Oil Co. at 44-50 Broadway, New York City, 475 tons, indefinitely postponed.

Bridge work for Pennsylvania railroad, 250 tons, bids being taken.

(*For complete prices see page* 1110)

Ore Selling

Will Continue to Center in Cleveland—Great Northern Transaction

Cleveland, Dec. 8.—Announcement was made in THE IRON TRADE REVIEW last week that the trustees of the Great Northern iron ore properties had made an arrangement with M. A. Hanna & Co. to sell the ore from the properties, was received with keen interest in Cleveland, where this transaction is taken as evidence that Cleveland is to retain indefinitely its prestige as the greatest ore selling center in the country. While, of course, business conditions will affect the amount of ore to be offered from Great Northern mines, if it is known that a conservative selling policy will be followed and while independent companies not having their own ore reserves will be more favorably situated in the future, care will be taken not in any way to demoralize the ore market.

Brazilian Ore Offered

New York, Dec. 8.—Eastern furnaces recently have been asked to bid on cargo lots of Brazilian iron ore, reported to have an iron content of about 65 per cent. As far as known, no sales have resulted from the offering of this ore for the reason that eastern furnaces continue indifferent toward any purchases of ore.

Grecian Railroads Buy

Order for Steel Sleepers Comes to American Mills—Santa Fe Buys Rails

New York, Dec. 8.—Steel makers in this country have been successful in capturing the order for 500,000 steel sleepers or ties for Greece, which recently was reported in the market by THE IRON TRADE REVIEW. This order has been divided between two manufacturers. It is believed that this will be the first time steel sleepers have been manufactured for the market in this country. France, England and Belgium previously had been supplying a large part of this demand for European railroads. These sleepers are manufactured of plates and are pressed to shape over dies. They weigh about 140 pounds each, indicating that the steel required for the full order will approximate 30,000 to 35,000 tons.

The Atchison, Topeka & Santa Fe railroad has placed an order for 54,000 tons of rails for 1915 shipment, with the Colorado Fuel & Iron Co., which is in addition to the 13,000 tons placed with the Illinois Steel Co., as previously reported. Bids went in this week on the 27,000 tons of rails for the Norwegian State Railways.

Car figuring continues to offer a little more promise. The Reading railroad has ordered 400 hopper sides and underframes from the American Car & Foundry Co. Another railroad not previously mentioned is figuring quietly for 500 cars. Inquiries now current total about 1,500 to 2,000 cars.

Ferro Sellers

Trying to Arrange for Definite Plan of Importing

New York, Dec. 8.—Stronger efforts are being made by sellers of ferro-manganese in this country to arrange with the English government through Washington's aid, a definite plan whereby shipments of this alloy may be allowed to come forward to regular consumers in this country. Hopes are entertained that a solution of the present embargo problem will be reached in the near future. At the moment, the situation is unchanged, and December deliveries still are held up on the other side. Small sales continue to be made at $68, seaboard, subject to the ability of the seller to make shipments. Several inquiries now are in the market, the total aggregating about 1,200 tons. A Philadelphia steel maker is holding off from placing 300 tons. A Reading, Pa., steel foundry has purchased about 1,500 tons of Bessemer ferro-silicon, which were obtained at a shade below the open schedule. Eastern sellers continue to report they are able to offer English spiegeleisen at $27, seaboard.

Demands of England

Washington, Dec. 8.—In a long private cable received by the State Department from Ambassador Page, at London, he has set forth the demands made by Great Britain in return for her lifting the export embargo on various products desired by American interests. Included in the list of commodities, it is said, are manganese ore and ferro-manganese. Counsellor Lansing, of the State Department, with other officials, is giving close study to the English demands, and in the meantime has refused to discuss them.

It is believed that England has asked this government to give assurance that contraband goods exported from American ports, intended for neutral countries, shall not ultimately reach enemies of the allies. Moreover, another demand is said to urge that after the government authorities here are satisfied that shipments leaving ports of this country are neutral, the British or French consular agents shall be notified of the fact and allowed to give their approval of the manifest. In the absence of official announcement as to the attitude of the State Department, it would seem highly improbable that this government would consent to the British requests.

It had been expected that pending the negotiations now under way, Great Britain would modify her embargo order and allow shipments from that country without restriction. Her stipulations, therefore, created surprise among department officials.

Alloys Lifeless

Pittsburgh, Dec. 8.—Although dealers report some inquiry for ferro-manganese, there is no snap to the market, and no recent sales have been made, so far as can be ascertained. There is no change in the position of quotations. Other alloys are dull and inactive.

The Petroleum Iron Works Co., Sharon, Pa., will surrender its Pennsylvania charter and will take out incorporation papers in Ohio. The company is capitalized at $1,200,000. The Pressed Steel Products Co. and the Pennsylvania Tank Car Co., subsidiaries, are capitalized at $500,000 each. Incorporators of the Petroleum company are: C. H. Todd, G. P. Bard, J. L. Consine, J. P. Sweeney and H. C. Knowles, all of whom, with the exception of Mr. Knowles, are named as incorporators of the subsidiary concerns.

Coke Active

Several Sales of Good Size Are Made to Blast Furnaces

Pittsburgh, Dec. 8.—Sixty thousand tons of Connellsville blast furnace coke a month have been sold for extended delivery the last three weeks, according to conservative estimates. The bulk of the tonnage involved was obtained on sliding scale contracts, based on pig iron prices. Two new inquiries, involving 25,000 tons a month, have come out this week. Standard 48-hour coke for future shipment is being held at $1.70 and $1.75, ovens. Foundry coke is inactive, and unchanged in position. The *Connellsville Courier*, for the week ending Dec. 3, says production was 179,439 tons, a decrease of 21,365 tons, compared with the week before.

Eastern Sale for All Year

Philadelphia, Dec. 7.—A New York state furnace has closed for 80,000 tons of Connellsville 48-hour coke for shipment throughout 1915 at slightly over $1.75, ovens. Two eastern Pennsylvania furnaces, one in the Schuylkill and the other in the Lehigh valleys, are in the market for their first half needs aggregating about 25,000 tons monthly minimum. First class brands of furnace coke continue to be quoted at $1.65, ovens, for spot and at $1.75, ovens, for first quarter or first half. The Norfolk & Western railroad is closing this week for its first half requirements of foundry coke.

Foundry Inquiry

New York, Dec. 8.—The American Locomotive Co. is inquiring for its requirements of foundry coke for the full year of 1915 of its Schenectady and Dunkirk plants, estimated to total normally 7,000 to 9,000 tons.

Inquiry for Furnace Coke.

Cincinnati, Dec. 7.—A southern furnace is inquiring for 15,000 tons of coke for shipment over the first half. This is the only inquiry of importance before the market, as the few furnaces in blast in southern Ohio are well covered by recent purchases and fully

For complete prices see page 1110.

90 per cent of foundries in this territory have contracts running up until next July. A good amount of coke is moving on specifications, but very little is being piled in furnace yards, which indicates that it is being used as fast as shipped. Prices on all grades of southern coke are unchanged, but are a little uncertain because of the lack of transactions to test them.

Smelter Coke.

St. Louis, Dec. 7.—Not much coke changed hands last week, but the interest is manifested by another inquiry for 15,000 tons of smelter coke in addition to the one for 15,000 tons which has been in the market a week or more. Coke prices are strong.

Tin Plate

Books Are Opened at $3.20—Active Buying Expected

Pittsburgh, Dec. 8.—The American Sheet & Tin Plate Co. on Dec. 3 opened books for first half shipment of tin plate on the basis of $3.20 for base size cokes, and independent makers adopted that figure as soon as it became general. While the prevailing price is $4 a ton below that announced Nov. 3, 1913, yet prices of materials which enter into the manufacture of tin plate are much lower today than a year ago. Sheet bars and pig tin, as indicated by THE IRON TRADE REVIEW, are selling at comparatively low figures. Tin plate consumers are showing considerable interest in requirements for 1915, and an active buying movement is expected to be enjoyed within the next 30 days.

Pipe Makers Need Orders

Pittsburgh, Dec. 8.—An unconfirmed report has been received to the effect independent oil interests have renewed plans to build a line from the Oklahoma fields to the gulf, which would involve 600 miles of pipe, or 50,000 tons. The project was being financed in Europe, but was abandoned upon the outbreak of war. No orders of importance have been placed, and no attractive inquiries are pending, so far as can be learned. Mills are operating on greatly reduced schedules. Boiler tubes, weak and irregular for 10 months, have not been changed in official quotations. Boiler tubes are being offered at wide ranges in price, making it difficult to offer accurate discounts.

The Calumet Car Co., Calumet, Mich., is working on a car patented by John Karku, master car builder of several mining companies. It is a side dumping car that can be operated by one man. It will be manufactured in various sizes from the ordinary railroad construction car up to complete sized gasoline or coal cars.

Very Slow

Is Improvement in Finished Lines—Report of Car Order

Pittsburgh, Dec. 9. (By wire.)—Specifications against contracts for finished steel products the first week in December ran slightly ahead of those of the corresponding period in November, several managers advise, but it is feared activity will not feature the market after the middle of the month. Consumers are not buying for delivery after Jan. 1, although numerous negotiations have been tentatively opened for first quarter requirements. Plates, shapes and bars are being sold at 1.05c for immediate delivery and 1.10c is being asked for forward shipments.

The Pennsylvania Railroad Co. has placed an order for 1,050 steel box cars to be built at the shops at Altoona, Pa., according to a report from that city. The cars will be turned out at the rate of 400 a month.

Personals

Benj. G. Fernald has resigned as sales manager of the Best Mfg. Co., Pittsburgh, in order to enter business in New York City about Jan. 1. Previous to his connection with the Best Mfg. Co., Mr. Fernald was identified with the General Electric Co.'s interests for about ten years.

A. E. Seelig has been appointed general sales manager of the Kerr Turbine Co., Wellsville, N. Y. Mr. Seelig was formerly manager of the machine tool department in the New York office of Schuchardt & Schutte. John A. Hense has been made St. Louis representative of the Kerr company. Mr. Hense has recently been connected with the National Malleable Castings Co., Chicago.

James C. Peil has resigned as foreman of the molding department of the South Works of the J. I. Case Machine Co., Racine, Wis., to accept a position as superintendent of the foundry of the Maxwell Motor Car Co., Dayton, O. For more than 16 years Mr. Peil was superintendent of the Pierce Machine Co.'s foundries, which subsequently were purchased by the Case company. Mr. Peil was tendered a banquet by his fellow employes of the J. I. Case works and was presented a gold Elk's charm. On the night following this banquet, the foundrymen of Racine tendered him a dinner and presented him with a gold chain.

METAL MARKETS

New York

Dec. 8.

The demand for copper which for a couple of weeks has been active, has fallen off, with the result that the market is weaker, due to lower offers on the part of second sellers. Electrolytic is quoted at 12.87½c to 13c, delivered 30 days, and it is intimated that some first hands would do the inside figure. Casting copper is quoted at 12.70c to 12.80c, delivered 30 days for ordinary grade. Good ordinary brands of prime lake are held at 13c, cash New York; lake sellers are well sold up and are not inclined to shade.

Spelter has been in good demand during the week. The brass mills, and galvanizers have bought liberally and a large demand has come from abroad. As a result, prime western brands are firm at 5.50c to 5.55c, St. Louis, or 5.65c to 5.70c New York.

The lead market has been quiet, due to the last reduction which the American Smelting & Refining Co. That company's New York price now is 3.80c. Independent producers ask 3.70c, St. Louis, which is equivalent to 3.85c, New York.

Demand for tin was good last week, particularly for futures. At present, however, the market is very dull and the price is declining. Spot and December are held at 32.50c and December from London at the same figure. All shipments from the Straits are quoted at 32.25c. Arrivals so far this month total only 185 tons, while the amount afloat is 1,920 tons.

Antimony has been in poor demand all week and although there is an improved inquiry today this is not sufficient to strengthen prices which have shown a weak tendency recently. This has been due to the increase in supplies by reason of arrivals, and low offers on resale lots. The prices importers ask, duty paid, New York, are: Cookson's 16c to 16.25c; Hallett's 14.75c to 15.25c; Chinese and Japanese, 12.75c to 13.25c. There is a fair business in futures, Chinese and Japanese for January and February delivery being done at 9.75c, in bond at New York.

Aluminum is firmer by reason of an improvement in demand, as well as a scarcity of stocks in the hands of importers. No. 1 ingot may be quoted at 18.50c to 19.25c, while 1915 requirements can be had at around 18.25c to 18.75c.

Harbison-Walker Report

The twelfth annual statement of the Harbison-Walker Refractories Co., Pittsburgh, for the year ending Sept. 30, 1914, shows a net surplus of $188,987.76, after charging the regular dividends on preferred and common stock. The profits for the year available for dividends on stock were $1,124,987.76, after charging off expenditures for repairs, improvements, depreciation, etc., compared with $1,525,964 for the year ended Sept. 30, 1913, and $1,321,690 for the year ended Sept. 30, 1912. The total surplus now stands at $6,279,764.88 as against $6,090,777.12 in the previous year. The balance sheet shows current assets of $3,960,710.85 and investment securities amounting to $1,068,861.50. Total assets are $35,616,036.60. Current liabilities foot up $1,036,378.17.

Eliminating Seams in Steel Rails

Interesting Description of the Mathias Method of Deseaming Rails With Consequent Improvement in the Structure

BY ROBERT W HUNT

NO PART of railway maintenance has been given more discussion and publicity by scientific bodies, technical publications, and the general press than steel rails.

FIG. 1—FACE OF INGOT BEFORE HEATING

The question of safety to human life and limb, to say nothing of property, is so dependent upon the quality of rails, that the reason for this publicity is easily understood. Moreover, the duty required of rails and the resulting stresses have increased so constantly, and the controlling factors incident to their manufacture have changed so much that the whole problem is an involved and interesting one.

Increased weight of rolling stock and speed of traffic have necessitated increasing the size of the rail sections, and hence their weight; and as many of the details of rail manufacture have been changed with such alterations, it is not surprising that new and unexpected physical weaknesses developed in the heavier rails. One of the most notable was failure through crescent-shaped pieces breaking out of the rail flanges, followed by at least one, and in many cases several, ruptures across the whole section of the rail. Investigation showed that in practically every instance of such failure there was a more or less pronounced seam running longitudinally in the bottom of the rail near its center, and thus immediately under its web. This seam occurs at the top of the curve of the crescent-shaped break and is undoubtedly the point at which the fracture starts.

Those familiar with steel rail making knew that it was practically impossible to make rails entirely free from seams, and that as the seamy conditions of the steel forming the head of the rail increased, so would its wearing quality decrease, but I think it was not until the disastrous experiences with the "moon-shaped" failures that the danger from seams in the base of the rails was fully realized. It is true that rails with actual flaws in their flanges have been rejected as first quality ones and that a very pronounced seamy condition of the bottom of the rail would also cause its rejection. Such rejections were the cause of frequent disputes between the mill operatives and the inspectors, the point being as to how far the inspectors were warranted in carrying their condemnation; but, as already said, it was not felt that a single seam, unless very pronounced, would be dangerous.

The crescent-shaped breaks were of such frequent occurrence that they indicated a very serious condition and led rail makers to experiment with the design of their rolling passes with a view to obviating the formation of the bottom seams. It was found that fewer seams were produced by such changes, but they were not entirely eliminated. While more or less successful in preventing the formation of seams through lapping on the bottom of the rails, the formation of seams

FIG. 2—FACE OF INGOT AFTER HEATING WITH SCALE REMOVED

in other parts of the section was not particularly affected.

It is a well-known fact that it is not alone the quality of rails which deteriorates through the use of seamy steel, and the fundamental causes in one will apply more or less to all cases. T. H. Mathias, assistant general superintendent of the Lackawanna Steel Co., Buffalo, determined that the most certain way of getting rid of seams was to remove that portion

---

The author of this article, Robert W. Hunt, is president of Robert W. Hunt & Co., engineers, Chicago, and a past-president of the American Society of Mechanical Engineers. The paper was read at the annual meeting of this society, held in New York, Dec. 1 and 2.

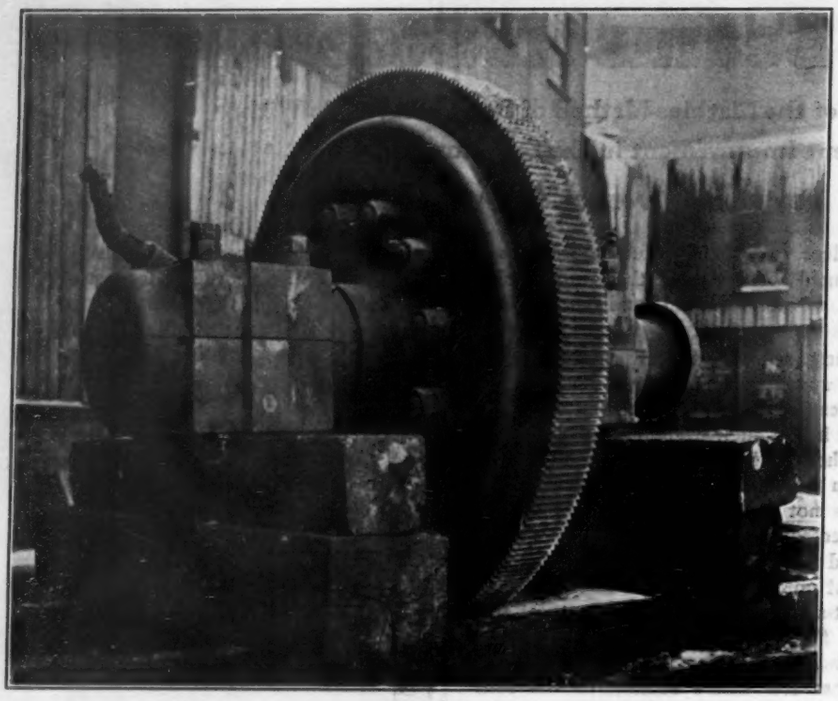


FIG. 3—MILLING TOOL

of the metal which contained them, and, as applied to steel rails, thus to eliminate them from both the base and head of the rail. This was a reasonable assumption, but its execution, I think, would have seemed very impractical to the minds of most metallurgical engineers.

Causes of Seams

Mr. Mathias reasoned that the primary causes of seams existed previous to any rolling of the steel, in fact, were incident to the casting of the molten metal into ingots. He knew that disc-like apertures were formed on the sides of ingots while the molten metal was being cast and probably were caused from air being entrapped against the sides of the ingot molds by the hot steel as it raised in the molds, a condition which was not controlled in regular manufacturing routine. This condition is illustrated by Figs. 1 and 2, which are photographs of the same face of an ingot. Fig. 1 shows the side as it would appear before heating, while Fig. 2 shows it after heating, with the adhering scale removed.

It will be appreciated that, as the section of the ingot is reduced and elongated in the rolling process, so, of course, will the apertures be stretched longitudinally and thus be formed into seams. If small imperfections would cause small seams, of course the seams resulting from larger ones would be proportionately greater and, therefore, more serious, both in length and depth.

Mr. Mathias demonstrated that there is another constant condition present in the rolling of large steel ingots, that being the formation of a decarburized surface on all four faces, about 5/16-inch deep, and containing from eight to ten points lower carbon than the metal immediately under it. The decarburized envelope undoubtedly is produced through the oxidizing conditions to which ingots are subjected in the soaking pits where they are heated preparatory to rolling. A thick oxide scale is always formed on the surface of ingots in the pits, so that conditions invariably are present for the production of such a layer of lower carbon metal on the outside faces. A photomicrograph of this lower carbon envelope or skin, or one showing a polished and etched cross-section of a part of an ingot which has been heated to a rolling temperature in the soaking pits, but not rolled, forces one to the realization that ingots of large section have both disc-like apertures on their four faces and a decarburized envelope in which they are contained.

Removing the Seams

Mr. Mathias was convinced that during the process of rolling ingots into rails it was practical to remove mechanically the parts of the enveloping steel which would form the top of the head and bottom of the flange of the rail, and experimented accordingly. He designed and his company installed as an addition to their rail train a milling, or hot sawing machine to cut off that metal without retarding the regular operation and thus interfering with the production of the rail mill. The machine is located in echelon in relation to the

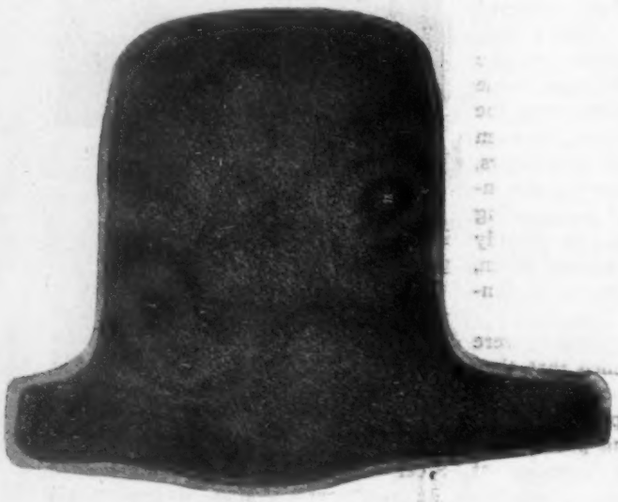


FIG. 4—CROSS SECTION OF BAR BEFORE ENTERING MILLING MACHINE

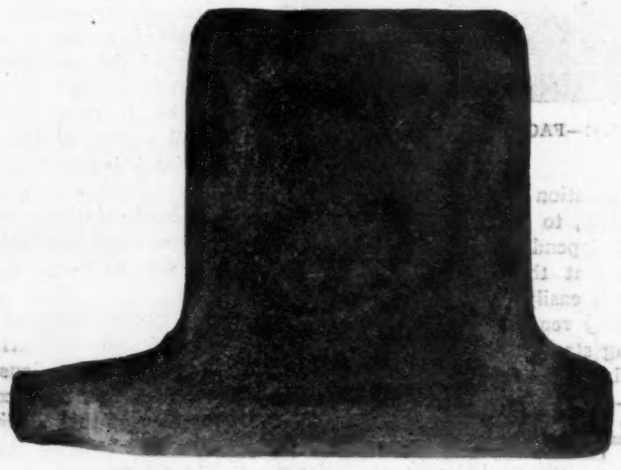


FIG. 5—CROSS SECTION OF BAR AFTER LEAVING MILLING MACHINE

rest of the rail train.

The ingot is reduced in the blooming rolls to an 8-inch by 8-inch cross-section and after cropping the ends the bloom further is reduced in the roughing or shaping stand of rolls by five passes. When it leaves these rolls it is approximately 75 per cent finished and at this period, it is entered between two pinch rolls with its base or flange side up. A bar which will make four 33-foot rails is at this point in the rolling operation about 60 feet in length; therefore, the area of metal to be cut off or removed in the milling machine is approximately ⅛-inch deep, 7 inches wide and 60 feet long. It is driven through the pinch rolls at the rate of 60 feet in 30 seconds.

The pinch rolls have a draft of about ⅜-inch and thus force the bar between the two milling saws, which are so arranged in the housing that they may be raised or lowered as desired. There is from 1/32 to 3/64 inch of metal milled from the head and base of the bar, the front end of which, immediately on passing from between the rolls, is caught by a second set of pinch rolls which have a draft of about 1/16-inch. These pinch rolls force the bar between the tools, pull it from between them, and also hold it in practically perfect line for the milling operation. The milling apparatus is driven electrically and requires about 600 horsepower for its operation.

Fig. 4 shows an etched cross-section of the piece preparatory to its entering the milling machine, and on it is clearly shown the enveloping layer of lower carbon steel. It is treated with the flange side up.

As the milled dust or particles of steel are thrown out, they are struck by water under pressure which forces them into a chute and also prevents the material from adhering together. In the chute they are carried below the mill and caught in boxes or receptacles suitable for charging as scrap into the open-hearth furnaces.

Fig. 3 shows one of the milling tools. It is 5 feet in diameter with an 8-inch width of face and revolves at a peripheral speed of 2,500 feet per minute, thus causing an engagement of about 400,000 teeth per minute on the hot rail bar. The teeth are of 0.80 per cent carbon steel, and it has been demonstrated that they will mill at least 30,000 tons of material without requiring dressing. The one shown had milled about 15,000 tons.

FIG. 7—PIECE OF RAIL BROKEN UNDER DROP PRESS

FIG. 6—TOP SURFACE OF UNTREATED RAIL

Fig. 5 presents the shape of the bar after it leaves the milling machine preparatory to further reduction in the regular rail rolls. The milling of the flange has not reached the extreme edges of the bar, and on the head side has not affected the corners. It is apparent that either by a modification of the shape of the piece as presented for treatment in the milling machine or, what probably will be more practical, changing the face of the tool, the milling can be extended to the extreme edge of the flange portion of the bar and somewhat around the corners of the top or head side. This undoubtedly will be perfectly practical and thereby eliminate the seams which may be located in those parts of the bar.

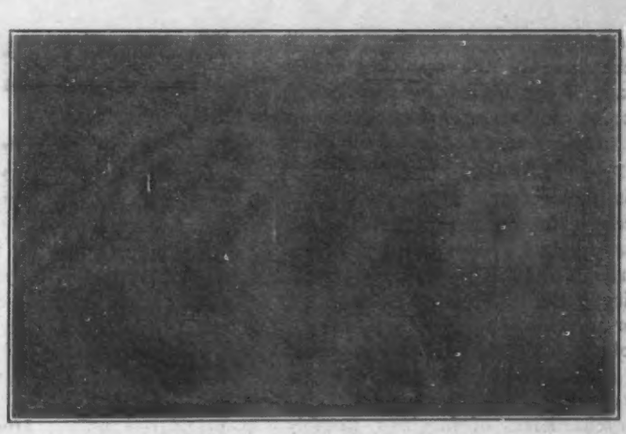


FIG. 8—TOP SURFACE OF MILLED RAIL

The work of rolling which the steel receives after the removal of the more or less laminated metal must produce a better product than if such elimination had not taken place, and, in the case of steel rails, it not only should make them less liable to breakage on account of seams in their flanges, but also enable them better to resist the abrasive effects of traffic.

During the many years of my connection with rail making, I have examined a great many etched specimens of rails, not only directly in connection with the process under consideration, but for various other reasons. From such experience, I can fully appreciate what Mr. Mathias has accomplished. The surfaces of practically all rails, when etched, will show some seams on both base and head, and very frequently the extent of such defects will not be appreciable if the scale has not been removed. Even then, it is not always an easy or certain matter to estimate the depth of the seams. When the rails have been subjected to the Mathias milling operation and still show pronounced seams, it has been found that breaking tests practically always will develop the fact that the suspicious marking is an actual seam. Fig. 7, which is a piece of rail broken under the drop press, plainly shows a pronounced seam in its flange directly under the center of its base, and is an illustration of a dangerous rail.

As the original defects on the sides

of the ingots vary in extent, so will the character of the resulting seams vary and it can be readily appreciated that some of them may have been too deep to have been eliminated completely by the milling.

It is patent that the process will be of great value in the preparation of blooms for axles and all other kinds of forgings. As is well known, it is practically the universal custom to endeavor to remove the seams developed in rolling axle billets by chipping them out through the use of pneumatic hammers, and for some of the higher characters of forgings, notably for automobile parts, the endeavor to eliminate the seams is carried to the extent of turning off the whole surface of the billets. I am confident that by the Mathias plan the greater part, if not all, of such work can be superseded, and I regard the invention and its practical installation as a notable achievement in the art.

At a meeting of the board of directors of the Crucible Steel Co. of America, Pittsburgh, recently, the following executive committee and officers were elected: Executive committee — Chairman, Herbert DuPuy; C. C. Ramsey, James H. Park, H. S. Wilkinson, H. S. A. Stewart, J. A. Sutton and H. D. W. English. Officers. —President, C. C. Ramsey; vice presidents, John A. Sutton, J. W. Dougherty, G. W. Sawgent and H. A. Brown; treasurer, George A. Turville; secretary, Charles W. Rowlands.

The Milwaukee Concrete Mixer Co. has received an order for $10,000 worth of power concrete mixers for delivery at Melbourne, Australia, through A. W. O'Mara, president of the Australian Metal Co., and Australian representative of the Milwaukee concern. Mr. O'Mara went to Milwaukee to place the order and will spend a month in the United States to purchase goods and materials on numerous Australian accounts.

Scrap Stealers.—Max and Hyman Meyer, proprietors of the Milwaukee Scrap Iron Co., Milwaukee, pleading guilty to receiving stolen goods owned by the government, were sentenced to serve six months in the house of correction. The grand jury indicted the Meyers for purchasing propeller blades worth $1,500, for $25 each from the keeper of the lighthouse supply station, Frank C. Allen, who must serve one year and six months. L. B. Searle, who acted as agent for the Meyers, must pay a fine of $100 and serve 60 days.

Formal Protests

Made Against Law Fathered by Organized Labor

Washington, Dec. 8.—Unusual interest is being manifested in the reply of the state department to the message sent it by Gov. Hunt of Arizona announcing the decision to postpone the proclamation of Arizozna's "80 per cent" law. The law, passed at the recent election at the behest of organized labor, requires a minimum of 80 per cent of the employes of any person or corporation in the state to be citizens of the United States. Gov. Hunt has asked permission to transmit the full text of the law to the state department.

Formal protests against the law have been lodged with the Department by the British and Italian ambassadors and a message was sent to Gov. Hunt asking if he had authority to postpone it. Secretary Bryan showed interest in the reply of Gov. Hunt, but is withholding comment pending official advices. Attack upon the law is made by the British government charging that it violates the fourteenth amendment of the constitution of the United States, which provides that no state shall "deny to any person within its jurisdiction equal protection of the laws."

The Italian protest cites the commercial treaty between Italy and the United States, ratified in 1871, which provides that citizens of each nation resident in the other shall have liberty "to carry on trade, wholesale and retail; to hire and occupy houses and warehouses, to employ agents of their own choice, and generally do anything incident or necessary for trade upon the same terms as natives of the country, submitting themselves to the laws there established."

The not presented by the British ambassador sought information as to the exact status of British residents of Arizona under the law. It was stated that British consuls there had sent word that suits to test the legality of the act were contemplated by British residents.

The state department replied to both embassies that it had taken steps to obtain complete information as to the anti-alien act, and expected soon to be able to furnish the desired information. As soon as the text of the Arizona law is available, it will be subjected to study by the department's legal advisers, who will also look up court decisions on anti-alien enactments of other states, such as California, Oregon and New York.

When advised by the state department of the protests made against the law and asked if there were not some means by which he could suspend the operation of the measure, Gov. Hunt despatched a message, saying:

"I am directed to issue a proclamation declaring the measure a law forthwith, upon receipt from the secretary of state of a certificate of the election returns. 'Forthwith', broadly interpreted, means within the reasonable time required to prepare the proclamation. I am very much adverse to prolonging the period preceding the issuance of the proclamation, but I realize the international aspect given by the protest of the Italian and British embassies and will await further advices from the government."

Death of Joseph Block

Joseph Block, one of the organizers of the Inland Steel Co., and a director in that company, died Dec. 6, at his home in Chicago. He was born in Pfaffenhofen, France, May 13, 1831, and at the age of seven years came to this country with his parents in a sailing vessel. He started his business activities at Cincinnati, founding the firm of Block & Pollak, in the early 60's. He organized the Cincinnati Forge & Iron Works and later both were incorporated into the Block-Pollock Co. of Chicago.

In 1893 he assisted in the organization of the Inland Steel Co., which started as a small affair at Chicago Heights. He assisted in the establishment of the present large works at Indiana Harbor, and had served as a director since its formation. He was also a director in the Buffalo Steel Co., Tonawanda, N. Y. He removed to Chicago in 1901, though he had been interested in business affairs of that city for many years previously.

Death of W. O. Wayman

W. O. Wayman, until recently superintendent and a director of the Illinois Malleable Iron Co., Chicago, died Nov. 27, in his sixty-first year. Mr. Wayman had for many years occupied a prominent place in the industrial growth of Chicago, having commenced his business career with the Crane Co., and for over 20 years being identified with the Illinois Malleable Iron Co. He retired from active business about a year ago, giving up his position as superintendent, but still remaining a director.

The James A. Farrell public school building at Sharon, Pa., named in honor of the president of the United States Steel Corporation, will be dedicated, Dec. 10. Mr. Farrell has been asked to attend the exercises.

THE ABC OF IRON AND STEEL

Electric Steel---I

BY F T SNYDER

THE commercial application of electric heat to steel-making is so recent that sufficient time has not elapsed to show which of the many forms of furnaces that have been brought forward is to prove the economic survivor. When Siemens first introduced the regenerative open-hearth steel furnace a great many different forms were built and used, but gradually the present general form emerged as being the most profitable to use under the usual conditions. In this article the effect on the cost of steel-making of the different types and forms of electric furnaces is shown.

In the month of June, 1880, Sir William Siemens first described to the Society of Telegraph Engineers of England an electric steel-melting furnace, with which he had made steel in a practical way. It was this Siemens who, with his brother, Frederick, designed the regenerative furnace which has today developed into our modern open-hearth steel furnace. The state of electrical engineering at that time is well set forth by the fact that the telegraph engineers represented its only technical society.

The furnace that Siemens used held about 50 pounds of steel and he reported a thermal

The following articles of this series previously have been published in THE IRON TRADE REVIEW: "Iron Ore and Mining Operations," Jan. 5; "Beneficiating Iron Ores," Feb. 2; "Rules for Figuring Penalties and Premiums on Lake Superior Iron Ores," March 9; "Transportation of Iron Ore on the Great Lakes," March 16 and April 13; "Ore-Handling at Lower Lake Ports," Oct. 12, 1911; "The Manufacture of Bee-Hive Coke," Jan. 4, 1912; "Pig Iron and Its Method of Manufacture," Jan. 2; "Manufacture of Wrought Iron," Feb. 6; "Manufacture of Crucible Steel," April 3 and April 10; "Manufacture of Open-Hearth Steel," May 15, 22 and 29, June 5 and 12; "The Rolling Mill Industry," Aug. 7, 14, 21 and 28; "Wire and Wire Rods," Oct. 2, 9, 16, 23 and 30, 1913; "Making Bessemer Steel," May 21; "Making Steel Castings," Aug. 6, 20 and 27; "Making Malleable Castings," Nov. 5 and 12; "Making Gray Iron Castings," Nov. 26, 1914.

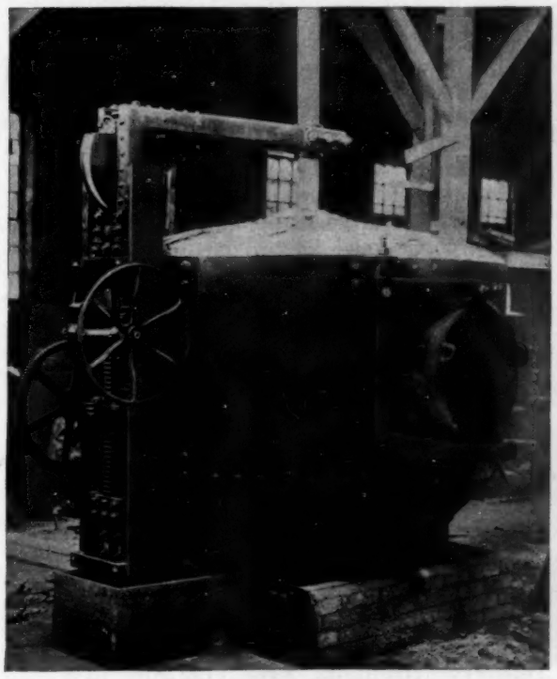


FIG. 1—A SINGLE ELECTRODE FURNACE, SNYDER TYPE

FIG. 2—A SNYDER FURNACE IN POURING POSITION

efficiency of 33 per cent. That is, of the heat equivalent of the electric energy used, 33 per cent was in the steel when poured from the furnace. Since that day many different types of electric steel-melting furnaces of all degrees of complication have been built, but it has only been within the last few years that thermal efficiences have been reached substantially higher than Siemens first obtained and the highest of these efficiences have been secured in furnaces of the same simple type as the original Siemens. Siemens also used at this time for steel-melting a furnace consisting of a crucible above, which a horizontal arc played between two horizontal electrodes. Sixteen years later, in 1896, Major Ernesto Stassano, of Turin, began building a series of furnaces which eventually resulted in the well-known modern form of Stassano steel-melting furnace. Stassano was apparently the first to make a serious effort to put electric steel-melting on a commercial basis. In 1899 he began the operation of a steel-casting plant, using 1,500 horsepower of electrical energy for steel-melting. Between Siemens and Stassano, the calcium carbide and aluminum industries had developed several types of practical industrial electric furnaces. Stassano himself was engaged in making carbide. This furnace experience from the other industries helped much in the new steel work.

FREDERICK T. SNYDER

The year after Stassano got his electric steel foundry at Turin into commercial service, Dr. F. A. Kjellen started the practical operation at Gysiuge, Sweden, of a very different type of electric steel furnace, based on induction. In 1887 Colby in America patented an induction furnace to be used for melting platinum and an electrical engineer, Ferranti, in England, later suggested the use of this type of furnace for melting steel, but Kjellen was the first to make steel in a commercial way with the induction type of furnace. The original installation, which was only of 58 kilowatts capacity, made excellent steel.

During the year 1901 steel appeared on the European market made in an electric furnace invented by Dr. P. Heroult. Heroult brought to the electric steel work a long experience in the making of aluminum in electric furnaces. The type of furnace which proved successful for steel-making was initially developed for securing carbon-free alloys. In 1903 a government commission from Canada visited and reported on the Heroult steel furnaces operating at Kortfors and LaPraz.

In 1904, Paul Girod, who had made a commercial success in the manufacture of ferro-alloys in electric furnaces, started to melt steel for castings in one of his furnaces. This furnace was modified to substantially the form of the Siemens furnace of 1880 and proved to be reliable and commercially profitable. As the Siemens furnace represented the first stage of electric steel, these four later furnaces, Stassano, Kjellen, Heroult and Girod, stand for the second stage of putting electric steel on a commercial basis. The change of condition from Siemens to Girod was fundamentally a lowering in the cost of electric energy. When the Siemens furnace was developed, the cost of electric heat for steel-making was commercially prohibitive. As the cost of electric current dropped, high carbon steel-making of crucible quality for tool purposes became commercially practical and these early furnaces appeared to meet the opportunity. It is of interest to note that the early furnaces were all developed in Europe when water power electricity was low in cost, where fuel was high in price, and where quality in steel commanded a high price.

In the decade that has passed since this beginning, the cost of electric current has progressively dropped. The introduction of the steam turbine and large gas engines has given this country, with its low-priced coal and large electric power organizations, electric energy at prices that have now made electric steel generally commercial. At first the types of furnaces which had been successful in Europe were imported, but it soon became evident that conditions here were different. Electric power, while cheaper than formerly, still had to be made from steam. Such water power as is available here is sold on the price basis of competing steam power. Electric steel furnaces for the United States have to be more efficient in their use of electricity than were used in Europe. In Europe highly trained engineers, both electric and metallurgical, are available at low cost. In the United States furnaces have to be built to look mostly after themselves. The manufacturing margin of profit is too narrow to permit anything like the technical supervision that is common in Europe. These different conditions have gradually developed in this country new forms of electric steel fur-

naces especially adapted to these American conditions—furnaces with high thermal efficiency, practically double that of the old Siemens type, built to run with relatively high cost electric power; furnaces of simple construction to be regularly handled by such labor as is available here, and furnaces with operating costs for refractories and electrodes low enough to afford an opportunity for competition with fuel furnaces which use low-cost coal and oil.

Electric steel first appeared in the American steel statistics in 1908 with one furnace and a production of 55 tons. This has now grown to some 60,000 tons from 22 electric furnaces.

Heat can be obtained from electricity in only one way, by passing an electric current through a conductor. The resistance of the conductor to the passage of the current heats the conductor. The modern scientific idea is that electricity is granular like sand. Each unit particle is called an electron. It is now well established that the chemical unit of matter called an atom consists of little whirling rings made up of electrons. Heat makes the atoms vibrate. A few of the electrons get knocked loose as the atoms bump against each other and these loose electrons wander around unattached. These electrons are unit electric charges. When a difference of potential is applied to the ends of a copper wire, the loose electrons, which are negative charges of electricity, begin to drift toward the positive end of the wire. It is this movement of the electrons that we call an electric current. Contrary to the popular idea that the movement of an electric current is instantaneous this drift of the electrons under the usual commercial voltages is quite leisurely, only a comparatively few feet per second. The atoms of all materials are endlessly and rapidly vibrating back and forth, and the energy of this vibration is what we measure as temperature. When the loose electrons making an electric current move along between the atoms of a conductor they occasionally bump into the atoms. These collisions increase the average speed of the atoms of the conductor. As it is usually said, the passage of the current raises the temperature of the conductor. When the temperature of the conductor is raised, the conductor begins to radiate heat to its cooler surroundings. With direct current the electrons always drift in the same general directions among the atoms of the conductor. With alternating current, the drift is in one general direction for a while and then in the opposite direction for an equal time. Whichever way the loose electrons move they bump into the atoms and increase the temperature by making the atoms vibrate faster.

F. T. Snyder

Frederick T. Snyder is president of the Metallurgic Engineering Co., Chicago, builder of industrial electric furnaces. Graduating in 1891 as an electrical engineer from the Massachusetts Institute of Technology, in 1895 he became chief engineer for the Colorado Iron Works, specializing in the designs of lead and copper smelting equipment. Later he developed similar lines of equipment for the E. P. Allis Co., at Milwaukee, and for the Wm. Hamilton Mfg. Co., in Canada. Locating in Chicago in consulting metallurgical practice Mr. Snyder worked out the problem of the complex refractory ores of Leadville by the invention and development of the high power Snyder magnetic separator. In the solution of this problem electric smelting was tried among other methods with results that led Mr. Snyder to give his entire energy to the electric smelting of lead and zinc ores.

When the price of electric power dropped to a basis that made electric steel melting commercial, the experience in electric furnace design and building acquired in this ore smelting work was turned into designing and developing a line of electric steel melting furnaces.

Types of Electric Furnaces

Electric furnaces are classified by the physical state of the conductor, which is heated by the current and which gives this heat to the material being treated in the furnace. Where the conductor is a gas the hot gas conductor is called an *arc* and furnaces with such heaters are called *arc furnaces*. The Siemens furnace is an arc furnace. The second class of furnaces have a liquid conductor. In the Kjellen furnace the liquid steel forms the conductor. Practically all small furnaces have solid conductors, usually of carbon or of a metal wire of high melting point such as platinum. Actually no furnace gets heat from one kind of conductor only. In all steel furnaces there are gases, liquids and solids, subjected to a difference of electric potential and consequently with more or less current flowing in each. These solid, liquid and gas conductors may electrically be in series or parallel. Practically electric furnaces are classified according to the way in which the major part of the heat is produced.

Three different forms of gas conductor or arc furnaces have developed into commercial use for steel-making. These differ in the relation of the terminals of the gas conductor to the bath of steel. In the first form the arc is horizontal, passing between two horizontal electrodes. The steel bath does not form part of the circuit. The Stassano furnace illustrates this form. In the second form the arc is vertical and passes between a vertical electrode for one terminal and the bath of steel for the other terminal. One end of the outside source of electricity is connected to the electrode and the other to the steel bath. In this form the current passes vertically through the steel bath from top to bottom. This form is illustrated by the Snyder furnace.

With the third form the arc also passes between a vertical electrode and the steel bath, but in place of the outside electric current being connected to the bath, the current passes through a second electrode, which connects with the return lead of outside circuit. In this form the current passes horizontally through the steel from one arc to the other. The Heroult furnace illustrates this type as applied to steel-making.

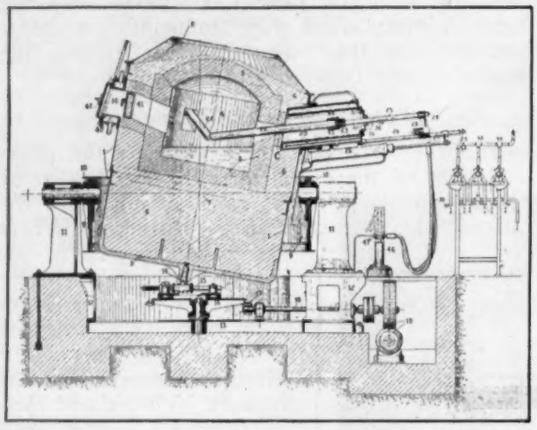


FIG. 3—VERTICAL SECTION OF STASSANO ELECTRIC FURNACE

Many single furnaces using various combinations of these forms have been built from time to time, but the benefits gained have not apparently offset the extra complications of the mixed forms, as their use has generally been restricted to the original installation.

Electric steel furnaces heated by the passage of the current through a liquid conductor can be divided into forms according to the way in which the current gets into the conductor. In steel furnaces the electric conductivity of the metal is much better than the conductivity of the slag, refractories or gases, and as these are in contact, most of the current passes through the metal. In the first form two contacts are made between the steel and the outside circuit and the current passes through the steel between the contacts. The Gin furnace illustrates this form. In the second form of liquid conductor furnace, the steel is in the form of a ring. A magnetic field is caused to move back and forth so as to cut through this ring of steel and so induce a difference of electric potential right in the metal itself. As the ring forms a closed electric circuit, this difference of potential causes an electric current to flow around the ring. No contacts are made between the outer circuit and the metal bath, as the energy travels from the outer circuit to the bath in the form of magnetic waves. Such furnaces are called induction furnaces and are illustrated by the Kjellen furnace. In these furnaces the electric action is the same as in a static transformer used with alternating current. The ring of metal forms the short-circuited secondary of the transformer.

Furnaces taking heat from the passage of an electric current through a solid conductor are not used industrially for steel-making. For laboratory use in analytic determination of steel several forms of furnaces using solid conductors have proved convenient and reliable. Such furnaces are divided in two forms. The first uses carbon for the heating conductor and the second uses platinum wire, which is the only commercial metal that does not melt at steel-melting temperature.

An electric steel furnace has to hold the bath of metal, keep the heat from getting away and support the electric parts for introducing the current. Heat loss by radiation from a furnace is proportional to the area of the outside of the furnace body. The holding capacity for steel is proportional to the volume. An electric furnace should have as large a volume as possible and as small an outside surface. Of all geometric shapes a sphere has the largest ratio of volume to surface, so an electric furnace should be as nearly spherical as possible.

Shape of the Furnace

Certain practical requirements make it necessary to depart from a completely spherical shape. Doors have to be supplied for putting in the charge to be melted. The liquid bath has to be below these doors so that the charge will not run out. The surface of the metal has to be accessible through the doors, so that slags can be removed in refining the steel. The main departure from the spherical form is due to the means of introducing the current. In the induction furnace the bath must be in the form of a ring and practical design requires that this ring be long, with narrow cross-section, so that the shape is far from spherical. The radiation heat loss per ton of capacity is therefore high in an induction furnace. The same is true of a liquid conductor furnace of the Gin type.

Steel is refined by absorbing the impurities into a slag. The time required is proportional to the area of contact between the steel and slag. The narrow steel channels of the liquid conductor furnaces only afford a small area of contact between steel and slag. In the modern forms of induction furnaces an extra chamber is added in which sufficient area can be obtained for the slag steel contact. This further in-

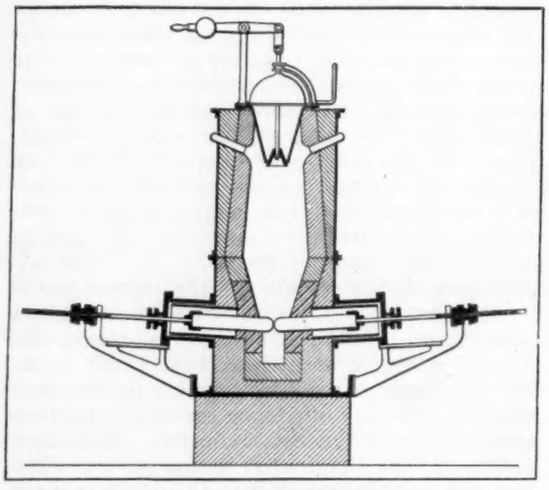


FIG. 4—FIRST PRACTICAL ELECTRIC STEEL FURNACE, SIEMENS, 1880

creases the radiating surface, but is a practical necessity in this form of furnace.

In small arc furnaces, where the current goes in on one electrode and comes out through another, these electrodes are at different potentials. All refractories when at steel-melting temperatures are fairly good electric conductors. A current therefore flows through the refractories from one electrode to the others. To reduce this current leak, the electrodes are spaced well apart, and as it is desirable to keep the arcs well away from the walls, this arrangement leads to an elongated rectangular form of furnace. The nearest approach to a spherical form is where a single central electrode is used. This also places the source of heat at the maximum distance from the walls and keeps down the refractory consumption.

Electric steel furnaces are now in commercial operation in sizes to hold from ¼ ton to 20 tons of steel per heat. At present there seems no necessity for the construction of larger ones. An electric steel furnace, in common with fuel furnaces, has two kinds of capacity. One capacity is the number of tons the furnace will hold per heat. The other capacity is the number of tons of steel the furnace will produce in 24 hours.

A 100-ton holding capacity open-hearth furnace, the largest size that has been found generally practical, makes about two heats a day, a 24-hour capacity of 200 tons. Some modern forms of electric steel furnaces readily make 10 heats in 24 hours, so that the maximum practical daily open-hearth output capacity can be equalled by an electric furnace with a 20-ton holding capacity.

An electric steel furnace of good design with an output of 200 tons a day requires a floor area about 40 feet square, including charging and working space. This is considerably less

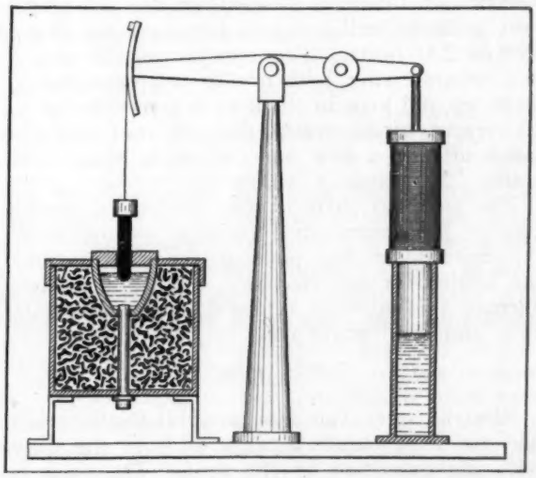


FIG. 5—FIRST FORM OF STASSANO ELECTRIC STEEL FURNACE, 1899

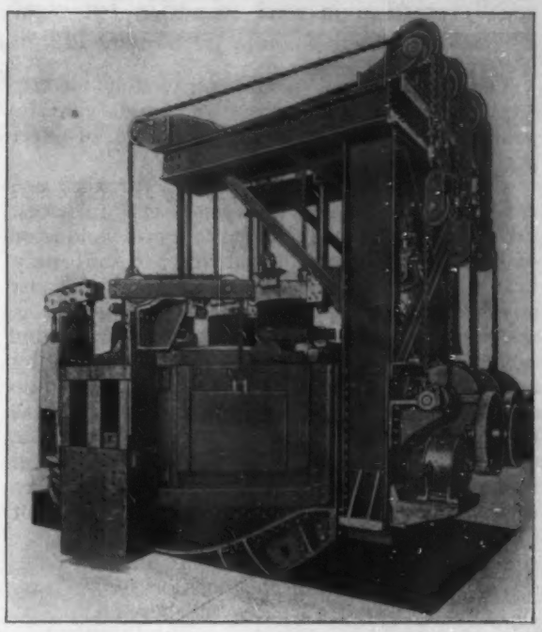


FIG. 6—REAR AND SIDE VIEW OF HEROULT FURNACE

than the space required for the same output from open-hearths.

The tendency is for the steel manufacturer to install an electric furnace with too large a holding capacity. The electric furnace melts so fast that the required output can usually be obtained with a relatively small holding capacity. For casting work the small holding capacity limits the weight of the largest single casting that can be poured, but as a commercial matter of profit, it will usually pay better to get the few large castings made outside. The furnace with the smaller holding capacity makes more heats per day. In a foundry this enables the floor to be poured off more often and so proportionately reduces the molding floor area required and the cost of building to cover it.

Electric power for an electric furnace is usually sold on the basis of a demand charge plus an energy charge. The demand charge varies from $1 to $2 per kilowatt per month. This is payable whether the furnace operates or not. Consequently the more hours a month the furnace operates the lower the demand charge per ton of steel. Where an electric furnace is running every working day, it does not cool off materially over night, so the radiation of heat goes on whether melting or not. The result is that there will be less radiation per ton the more constantly the furnace is operated. Continuous operation saves both in the price of power per kilowatt hour, and in the number of kilowatt hours used per ton of steel. As far as practical, the tonnage of electric steel required per day should be obtained from a small furnace run as many hours a day as possible. Night molding is not

usually practical in steel foundries, but night pouring from electric steel furnaces has proven to be good practice.

The small hand tilted quarter-ton electric steel furnaces are dependable and can be pushed to make two and three tons of steel per day in two-shift service.

The dimensions of all electric furnaces are small in comparison with open-hearth furnaces. Steel, both solid and liquid, is a good conductor of heat. It is practical, therefore, to uniformly heat the bath in an electric furnace by almost any method of applying the heat. There is a striking laboratory experiment in which water is boiled in the top of an inclined tube by applying heat near the top of the tube, while a piece of weighted ice remains unmelted at the bottom of the tube. This is because the water is such a poor heat conductor. Steel is a good heat conductor. In all arc furnaces the heat is applied at the top of the metal, but the high heat conductivity of the steel quickly equalizes the temperature throughout the bath.

This also applies to the position of the arc. In some forms of furnaces the heat is applied through a single arc at the center of the bath, so as to reduce the wear on the walls of the furnace. In the largest of such furnaces the outer edges of the bath are only about as far from the arc as twice the distance from the top to the bottom of an open-hearth steel bath. After the bath is melted there is substantially no difference in temperature between its different parts. This is, to a considerable extent, due to the motion of the bath caused by the current. The portion of the bath carrying the current moves so as to tend to increase the length of the circuit. In a single electrode furnace this causes the metal to circulate from the back toward the front in the center line of the bath and back again along the sides.

In the three electrode form of furnace, having the metal in circuit, the current causes local circulation between each pair of electrodes. In the three electrode form of furnace, in which the arc passes between the electrodes, without reaching the metal, the current does not cause a circulation of the metal.

Lining

An electric steel furnace can be lined either acid or basic. Which should be used in an installation is determined entirely by commercial consideration. Each lining, when properly put in, is equally reliable and convenient in operation. With a basic bottom refining can be done. To do refining in an electric furnace cuts down the output per day in tons and so increases the cost of labor, electricity, electrodes and refractories per ton of melted metal. The basic bottom material also costs more than acid bottom sand.

Steel scrap which has to be refined costs less than steel scrap which can be melted and poured without refining. If enough can be saved in the purchase of scrap to pay the extra cost of refining, a basic bottom should be used. If the purer scrap can be purchased low enough, the acid melting will work out cheaper. The kinds of scrap available and the prices for different grades vary with different localities. Which is the better commercially for any given place can be readily determined before the lining is put in. If conditions in the scrap market change, the lining can be changed in a few days' time from acid to basic or back again. The kind of lining used does not affect the rest of the construction of the furnace, which applies equally well to either acid or basic lining. There is a general belief that acid steel is better physically than basic steel. On examination this usually resolves itself in the fact that steel as good as the market will pay for can be made at a somewhat lower cost on a basic bottom. This applies equally to electric and to open-hearth steel furnaces.

Electric furnace bottoms are usually put in cold, not burned in, as are open-hearth bottoms. For basic bottoms double shrunk magnesite is the only practical material. Dolomite can be used for patching, but is not satisfactory for the construction of a new bottom. For acid bottoms, crushed ganister is used for the original construction and the repairs are made with regular open-hearth bottom sand, which is a silica sand somewhat less refractory than steel-molding sand, so that it will sinter and stick strongly to the bottom.

When a new bottom is first used, it is customary to melt a wash heat of cast iron and carry this up to a high temperature to set the bottom into a solid mass. The life of a bottom is practically indefinite as any holes that form are patched after each heat by filling them with bottom material, as soon as the metal is poured. Before patching, any metals in the holes are run out by tilting the furnace.

Whether acid or basic bottom is used, the roof is made of silica brick, which is the only material that has proven entirely reliable for electric steel-melting. Good grades of silica roof brick in well-designed furnaces, last from 150 to 200 heats. The roof is usually made in a separate ring, with one or two extra roofs made up and kept in stock to dry. With fairly convenient arrangement, the old roof can be taken off and a new one put on in about two hours. This usually is done on Sunday.

The essential parts of the mechanical structure of an electric steel furnace are the shell, the mechanism for pouring the charge, and the holder for the electrode. In an induction furnace this latter is replaced by the magnetic core and its electric coils.

Shell

Electric steel furnaces are relatively small and the shell usually extends all over the body with the exception of the roof. The shell is usually steel from ¼ inch to 2 inches in thickness. In some early electric steel furnaces,

(*Continued on page* 1110b.)

Uniform Design of Crane Wheels

Interesting Results of Tests Showing Relation of Diameter, and Flange and Tread Thicknesses on Strength of Wheels—Urges Standardization

BY F K VIAL

THE Griffin Wheel Co., Chicago, has just concluded a series of tests of the properties of chilled iron as related to crane wheel service, in an effort to establish standard designs. The breaking strength and bearing powers were determined by the use of a 300,000-pound Riehle testing machine in the R. W. Hunt & Co. laboratory. As a result of these tests, the design of wheels can now be standardized to give a uniform factor of safety for any operating condition. This is particularly important in the heavy bridge type of cranes on account of the large investment involved in the enormous structures now carried on chilled iron wheels of the type shown in Fig. 1. During the past century, chilled iron has been the standard material for the manufacture of car wheels, and notwithstanding the tremendous development in car capacities and the speed at which traffic is moved, the chilled iron car wheel is standard today for rail-borne traffic, representing at least 97 per cent of wheels in freight service. This type of wheel is standard because of the remarkable properties adapted to wheel service. The qualities which are sought after in wheels of all descriptions are: Sufficient bearing strength; high resistance to wear and distortion through heavy pressures on the small area of contact between tread and rail; the chilled iron tread, on account of the absence of ductility and coupled with slow wearing qualities, retains the rotundity of the wheel to a larger extent than any other metal; sufficient softness of hub to permit machining; flange must have high wearing qualities, and sufficient strength to withstand all side thrusts imposed; sufficient toughness in hubs to permit wheels to be pressed on axles without cracking, and sufficient elasticity and friction to keep them tight on their seats in service; they must not weaken through crystallization; uniformity and hardness between all wheels of a set and in all parts of the tread of each wheel.

FIG. 1—DOUBLE FLANGE CHILLED IRON CRANE WHEEL

Chilled iron possessses all the qualities that are required in heavy wheel service, and if the design is in keeping with the requirements, there is no occasion for any structural failure, regardless of the loading. In fact, the limiting factor for heavy concentrated loads will always be the ability of the rail to carry the load without permanent injury to the surface, rather than any consideration on the part of the wheel. There are less chances for flaws, seams, etc., in chilled iron than in steel, and chilled iron also has the advantage by not being affected by crystallization, and so hard that the metal will not crush or flow under the heaviest concentrated loads.

In order to design properly, we must know the relation of the diameter of the wheel to the bearing power of the rail, the power required to propel the crane, and the flange strength. We must also know the relation of flange pressure to the load carried. With all these factors determined, the designing of wheels for crane service can be placed on a rational basis.

A rational design for a wheel must necessarily take into consideration the nature of the track on which the wheel is intended to run. The tread must be wide enough to permit the use of a rail having a sufficient width of head to correspond with the loads which are to be carried. A series of tests was conducted for the purpose of determining the behavior of steel rails under heavy loads on chilled iron wheels, and particularly the effect of the diameter of the wheel on the bearing power of the rail. In these tests, a 150-ton Riehle testing machine was used for applying the load, and a deflectometer for measuring the depressions. The wheel was set up on a steel block on the platform of the testing machine, and a bracket was clamped to the wheel to carry the deflectometer. The rail was set up in an inverted position on top of the wheel, and the load was applied at the base of the rail. The wheels used were chilled iron, 15 inches, 20 inches and 33 inches in diameter. Test was begun with wheels rough, just as they came from the foundry, but the results obtained were so erratic that all wheels were ground to a true circle and again tested. Treads were ground straight with no taper. An 85-pound rail was used. The results of the tests are shown in Figs. 2-4. Chilled iron wheels are not appreciably flattened at any load, and, therefore, all the depression is necessarily in the rail head. The tests showed that the mean intensity of the stress over the area of contact was about 100,000 pounds per square inch for the 33-inch chilled wheel and 86,000 pounds for a 44-inch steel driver. It is evident that the steel driver was of softer material than the rail and the chilled iron wheel was harder. In the case of the chilled iron wheel the stress of 100,000 pounds per square inch represents the hardness of the rail and not that of the wheel. The elastic limit of the rail was 50,000 pounds, from which we can assume that its ultimate compressive strength was about 100,000 pounds per square inch, or exactly the same as the stress on the area of contact. The most remarkable element in these tests was the fact that not much less stress was produced over the smallest area of contact than over the largest, showing that the maximum stress does not vary much with the depth of the depression at the center.

In Table III is shown the safe maximum limiting load for crane wheels. The loads show the carrying capacity of the rail only and do not indicate the strength of the wheel. Loads given are 50 per cent of loads carried at the elastic limit in the rail as shown by a depression of 0.007 inch. Through tests it was determined that the

The author of this article, F. K. Vial, is chief engineer of the Griffin Wheel Co. The paper was read at the annual meeting of the American Society of Mechanical Engineers, Dec. 2.

TABLE I—ULTIMATE STRENGTH OF DOUBLE FLANGE CRANE WHEEL FLANGES

5-Inch Throat.

Test.	Diameter, inches.	—Flange— Height.	Thickness.	Height of point of application above tread.	Weight, pounds.	Angle of thrust deg.	min.	Load applied, pounds.	Reaction along toggle.	Horizontal component of reaction
1	16	¾	1¼	⅜	275	11	32	117,000	292,000	286,000
						12	22	119,000	277,000	271,000
2	16	¾	1¼	⅜	331	7	16	100,000	395,000	392,000
						7	16	97 000	383,000	380,000
3	16	¾	2¼	⅜	381	13	54	275,000	572,000	555,000
						13	54	300,000	624,000	606,000*
4	16	¾	2¼	⅜	434	17	10	300,000	508 000	485,000*
5	20	1	1¼	½	484	8	38	95,850	319,000	315,000
						8	38	86,500	288,000	284,000
6	20	1	1¾	¼	570	35	27	192,000	165 000	133,000
						36	53	186,000	154,000	123,000
						37	50	297,000	242,000	190,000
7	20	1	2¼	¼	647	13	54	167,000	348 000	337,000
						9	5	129,000	408,000	403,000
						8	19	220,000	760,000	752,000
8	20	1	2¾	⅜	740	7	37	143 000	539,000	534,000
						6	27	143,000	636,000	633,000
						9	51	148,000	432,000	426,000
9	33	1	1¼	¼	860	14	40	259,000	511 000	494,000
						9	13	147,000	459,000	453,000
						7	16	137,000	541,000	537,000
10	33	1	1¾	¼	1,100	9	13	250 000	780,000	770,000
						9	13	241,000	752,000	742,000
						6	54	217,000	903,000	896,000
11	33	1	2¼	¼	1 260	6	54	208,000	865 000	859,000
						13	6	300,000	672,000	644,000*
12	33	1	2¼	½	1,260	12	32	180,000	414,000	404,000
						12	55	185 000	423,000	405,000
						4	54	232,000	1,359,000	1,353,000
16	30	1	2¾	¼	1,130	4	54	231,000	1,352 000	1,344,000
						8	22	300,000	1,030,000	1,020,000*
17	36	1¼	2	¾	1,660	26	45	180 000	200,000	178,000
						27	43	207,000	222,000	199,000
18	36	1¼	2	¾	1,660	27	4	179,000	196,000	175,000
						27	23	182,000	197 000	175,000
22	20	1	1¼	¼	484	15	28	231,000	433,000	417,000
						15	28	300,000	562,000	542,000*
20	20	1	1¾	¼	570	16	16	300 000	535,000	514,000*
23	20	1	2¼	¼	647	17	10	300,000	508,000	485,000*
19	20	1	2¾	¼	740	16	16	300,000	535,000	514,000

*Did not break.

TABLE II—BREAKING STRENGTH OF DOUBLE FLANGE CRANE WHEELS

Load Applied ½-Inch above Tread in Tests 1-33: Load Applied ¼-Inch above Tread in Tests 34-47.

Test.	Diameter, inches.	Flange thickness, inches.	Throat thickness, inches.	Height of flange, inches.	Angle of thrust, deg.	min.	Actual load, pounds.	Load when first crack appeared.	Horizontal component.	Component along toggle.
1	33	1¼	1¾	1	21	6	163,000	.....	211,000	226,000
					20	11	96,000	.....	130,000	139,000
2	33	1¼	2½	1	20	11	129,000	.....	175,000	187,000
					20	11	98,000	87,000	133,000	142,000
3	33	1¼	3¼	1	20	11	110,000	106,000	149,000	159,000
					19	53	99,000	80,000	136,000	145,000
4	33	1¾	1¾	1	19	16	101,000	78,000	144,000	153,000
					20	29	104,000	95,000	139,000	148,000
5	33	1¾	2½	1	21	6	152,000	79,000	197,000	211,000
					18	40	143,000	123,000	211,000	223,000
6	33	1¾	3¼	1	19	16	177,000	128,000	253,000	268,000
					17	46	166,000	109,000	260,000	272,000
7	33	2¼	1¾	1	18	4	127,000	99,000	195,000	204,000
					18	4	135,000	86,000	207,000	217,000
8	33	2¼	2½	1	17	46	186,000	106,000	290,000	304,000
9	33	2¼	3¼	1	17	10	213,000	107,000	344,000	360,000
10	33	2¾	1¾	1	16	34	143,000	74,000	240,000	250,000
11	33	2¾	2½	1	18	40	178,000	73,000	263,000	278,000
12	33	2¾	3¼	1	7	29	199,000	171,000	757,000	764,000
13	20	1¼	1¾	1	17	28	39,000	.....	62,000	64,000
14	20	1¼	2½	1	13	6	38,000	.....	81,000	83,000
15	20	1¼	3¼	1	14	58	30,000	.....	170,000	173,000
16	20	1¾	1¾	1	14	47	51,000	.....	96,000	99,000
17	20	1¾	2½	1	14	17	54,000	.....	106,000	109,000
18	20	1¾	3¼	1	17	46	61,000	.....	95,000	100,000
19	20	2¼	1¾	1	8	38	61,000	.....	200,000	203,000
20	20	2¼	2½	1	15	5	54,000	.....	100,000	103,000
21	20	2¼	3¼	1	10	40	85,000	59,000	225,000	229,000
22	16	1¼	1¾	¾	18	40	37,000	.....	54,000	57,000
23	16	1¼	2½	¾	21	6	44,000	.....	60,000	61,000
24	16	1¼	3¼	¾	22	57	55,000	.....	64,000	70,000
25	16	1¾	1¾	¾	14	11	77,000	.....	152,000	157,000
26	16	1¾	2½	¾	20	11	74,000	.....	106,000	108,000
27	16	1¾	3¼	¾	19	16	88,000	.....	125,000	130,000
28	16	2¼	1¾	¾	29	1	98,000	78,000	88,000	101,000
29	16	2¼	2½	¾	25	48	105,000	79,000	108,000	120,000
30	16	2¼	3¼	¾	25	10	138,000	106,000	146,000	162,000
31	16	2¾	1¾	¾	21	25	106,000	82,000	135,000	145,000
32	16	2¾	2½	¾	21	7	135,000	86,000	174,000	187,000
33	16	2¾	3¼	¾	19	53	160,000	105,000	221,000	235,000
34	33	1¼	1¾	1	12	8	91,000	81,000	211,000	216,000
35	33	1¼	1¾	1	10	40	74,000	168,000	196,000	200,000
36	33	1¼	2½	1	11	15	125,000	95,000	314,000	320,000
37	33	1¼	2½	1	12	43	127,000	83,000	281,000	288,000
38	33	1¼	3¼	1	10	40	152,000	111,000	403,000	410,000
39	33	1¼	3¼	1	10	58	131,000	91,000	337,000	344,000
40	30	1¼	5	1	12	43	97,000	.....	214,000	220,000
41	30	1¼	5	1	10	40	96,000	79,000	254,000	259,000
42	30	1¼	5	1	11	33	87,000	80,000	212,000	217,000
43	30	1¼	5	1	11	15	85,000	75,000	213,000	217,000
44	30	1¼	5	1	13	18	123,000	.....	260,000	267,000
45	30	1¼	5	1	12	25	77,000	70,000	174,000	179,000
46	30	1¼	5	1	12	25	103,000	96,000	233,000	239,000
47	30	1¼	5	1	9	48	93,000	71,000	269,000	273,000

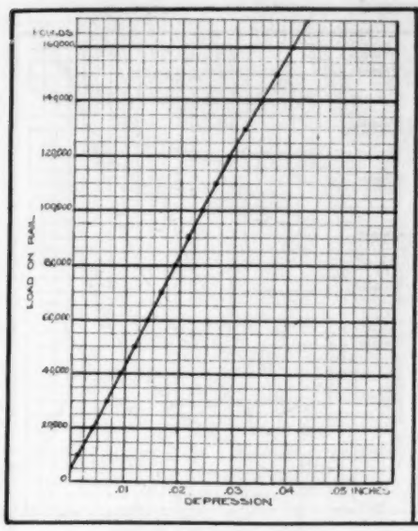


FIG. 2—DEPRESSION IN RAIL UNDER LOAD ON 15-INCH CRANE WHEEL

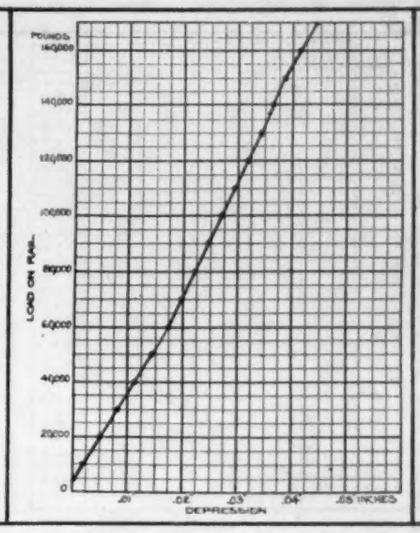


FIG. 3—DEPRESSION IN RAIL UNDER LOAD ON 20-INCH CRANE WHEEL

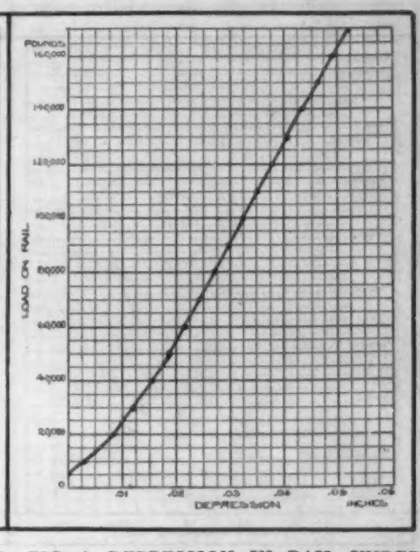


FIG. 4—DEPRESSION IN RAIL UNDER LOAD ON 33-INCH CRANE WHEEL

power required for locomotion decreases as the diameter of the wheel increases. Reduced to percentages based on the 33-inch wheel it was found that the 24-inch wheel would require 25 per cent more power and the 16-inch wheel 68 per cent more power than the 33-inch wheel.

After a number of preliminary experiments, the method chosen to test the strength of flanges was the use of toggles, applied against the wheel flanges under the ram of a 300,000-pound Riehle testing machine. In testing these wheels, pressure was applied to the toggle until the weighing bar registered 80,000 pounds, when an accurate impression was taken of the position of the toggle. From these impressions the angle formed by the arms of the toggle with the horizontal was measured, and the horizontal pressure against the flange computed.

TABLE III—LIMITING LOADS ON CRANE WHEELS

Diameter of Wheel	0.00392-Inch Depression: Length of Contact A.S.C.E. Rail	0.00392-Inch Depression: Load on New A.S.C.E. Rail	0.00392-Inch Depression: Load on Slightly Worn A.S.C.E. Rail	0.00250-Inch Depression: Length of Contact Flat Top Rail	0.00250-Inch Depression: Load on Flat Top Rail 2 Inches Wide
12	0.434	23,000	46,000	0.347	78,300
16	0.501	26,600	53,000	0.400	90,300
20	0.561	29,800	60,000	0.448	101,000
24	0.614	32,600	65,000	0.490	111,000
30	0.687	36,400	73,000	0.548	124,000
33	0.720	38,150	76,000	0.575	130,000
36	0.752	39,900	80,000	0.600	135,000

The wheels tested were double flange wheels with chilled tread and flanges. Wheels were 16 inches, 20 inches, 30 inches, 33 inches and 36 inches in diameter. The 16-inch, 20-inch, 30-inch and 33-inch wheels were cast with four thicknesses of flanges, viz., 1¼ inches, 1¾ inches, 2¼ inches and 2¾ inches. This range of diameters and flange thicknesses was considered sufficient to cover present day requirements, both as to strength and bearing area. The flange sections of the 36-inch wheels were not of the same design as those of the smaller diam-

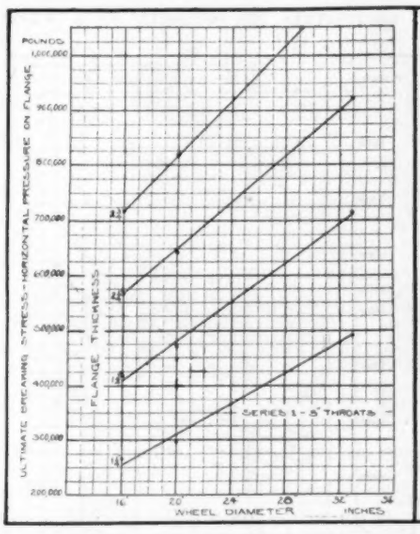


FIG. 5—EFFECT ON FLANGE STRENGTH PRODUCED BY INCREASE IN WHEEL DIAMETER

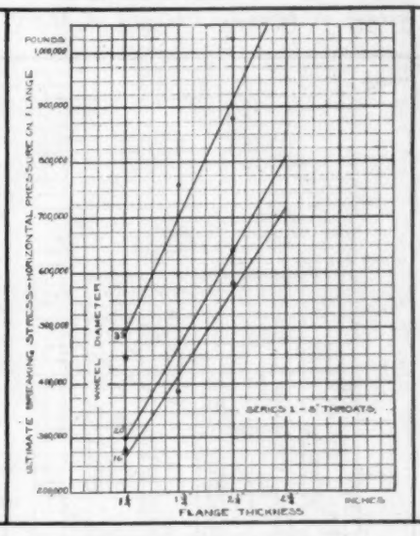


FIG. 6—EFFECT ON FLANGE STRENGTH PRODUCED BY INCREASE IN FLANGE THICKNESS

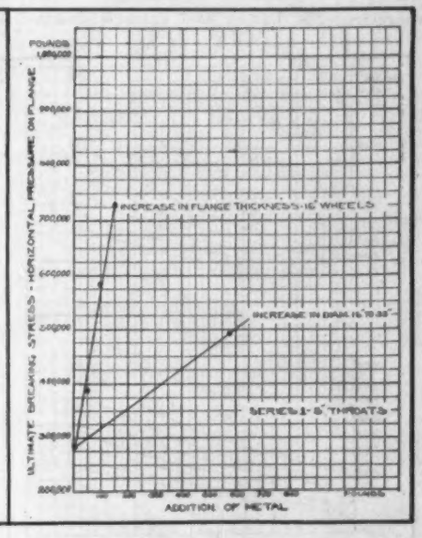
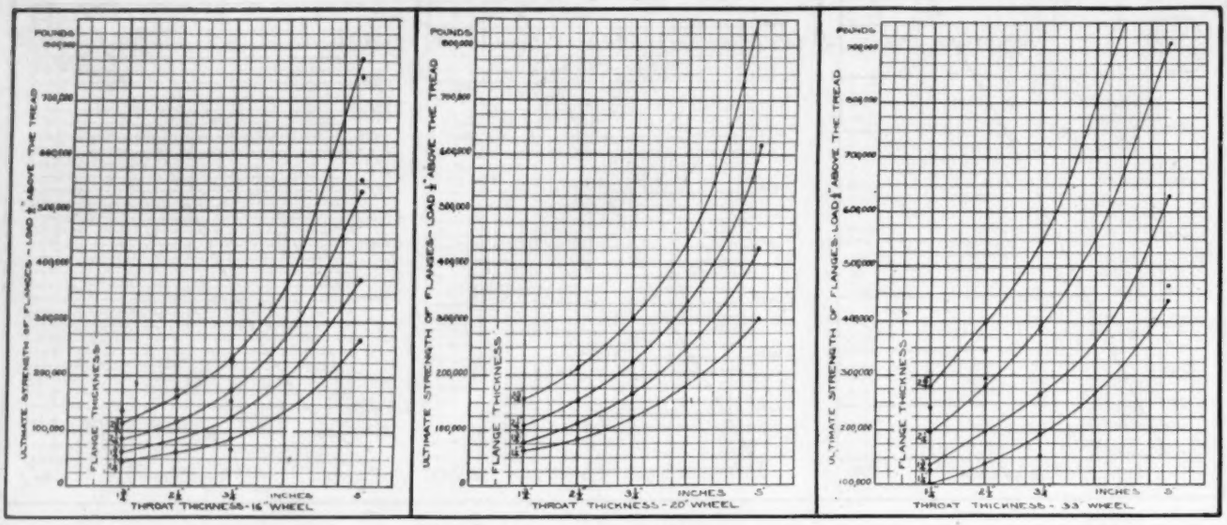


FIG. 7—INCREASE IN FLANGE STRENGTH SECURED BY INCREASED DIAMETER COMPARED WITH INCREASE OF FLANGE THICKNESS


POUNDS
ULTIMATE STRENGTH OF FLANGES - LOAD 1" ABOVE THE TREAD
FLANGE THICKNESS
INCHES
THROAT THICKNESS - 16" WHEEL
THROAT THICKNESS - 20" WHEEL
THROAT THICKNESS - 33" WHEEL

FIGS. 8-10—ULTIMATE STRENGTH OF FLANGES OF 16-INCH, 20-INCH AND 33-INCH CHILLED IRON WHEELS WITH VARIOUS FLANGE AND THROAT THICKNESSES

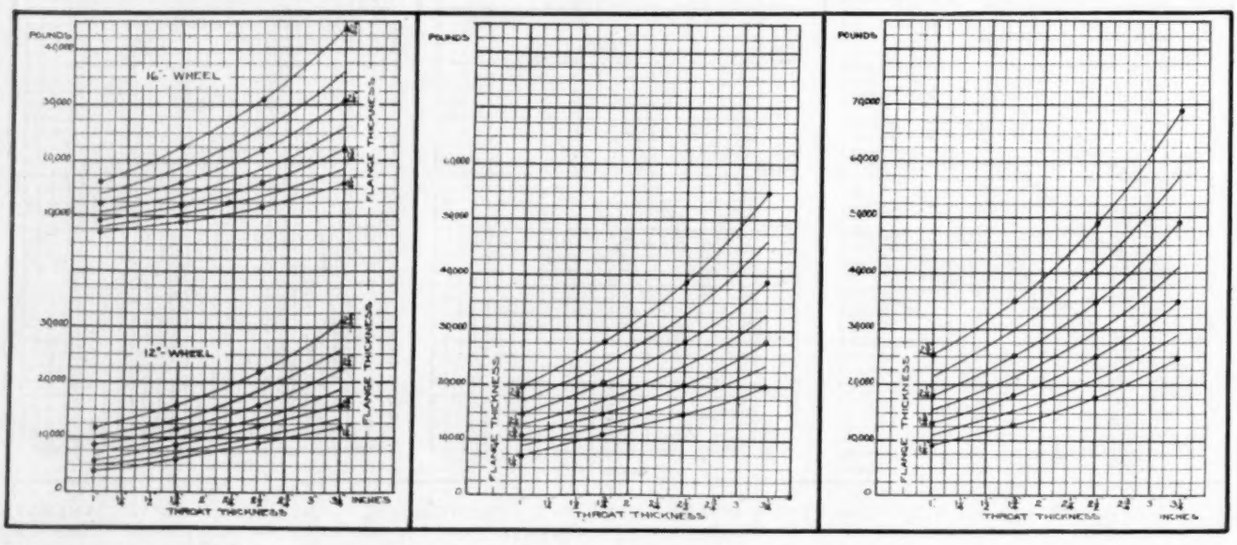
eters. Nearly all wheels cracked through the chill at from 50 to 75 per cent of the load shown at ultimate failure. These cracks were not sufficient to cause the weighing beam of the testing machine to fall, and could rarely be seen until some time after they were first heard. Many of the wheels after final failure only showed open cracks, the broken piece of flange adhering at the end of the fracture. Final rupture was accompanied by a noise, explosive in violence. The first failure represents the ultimate strength of the chilled or white iron. The ultimate failure represents the rupture of the gray iron. The coefficient of elasticity is evidently different in the two kinds of iron, and the necessity for backing up the chilled iron with gray iron is clearly indicated. All fractures occurred through the throat of the flange and ranged downward through the tread at an angle approximating 30 degrees and ranged outward toward the face of the wheel.

The strength of flanges increases with the larger diameter of wheels and this rate of increase in strength with the increase in diameter of wheel is higher with the heavier flanged wheels than with the thinner flanges. The curves in Fig. 5 show that from the 1¼-inch flange to the 2¾-inch flange, the rate of increase in strength is higher with each successive flange thickness.

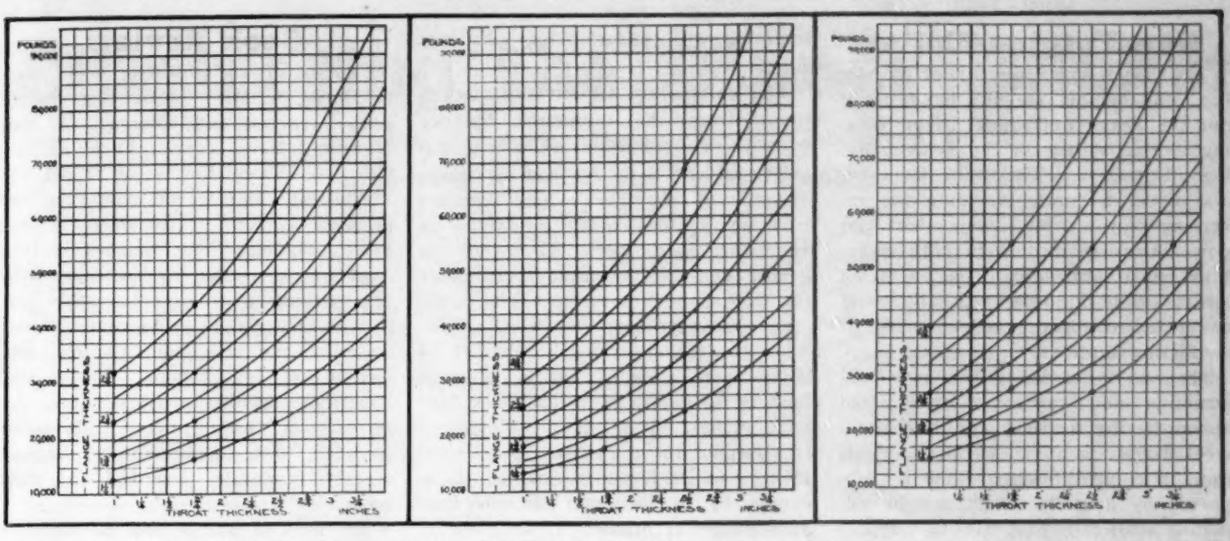
Increase in Ultimate Strength

For a 1¼-inch flange between the limits of sizes of wheels tested, there is an increase in ultimate strength of flange of 13,000 pounds for each 1-inch increase in diameter of wheel. For a 1¼-inch flange there is an increase in ultimate strength of 17,000 pounds for each 1-inch increase in diameter. For a 2¼-inch flange there is an increase in ultimate strength of 19,000 pounds for each 1-inch increase in diameter. For a 2¾-inch flange there is an increase of 21,000 pounds for each 1-inch increase in diameter. As shown in Fig. 6, the rate of increase of ultimate strength with increase in flange thickness is more rapid with the larger diameters of wheels. The flange strength of the larger size wheels varies directly with the thickness, in other words, doubling the thickness doubles the strength but with the smaller sizes, doubling the flange thickness more than doubles the strength, the ratio being about 1:2.2.

In Fig. 7 are shown curves which will afford a comparison of the amounts of additional metal required to increase the strength of a wheel



FIGS. 11-13—SAFE STRENGTH OF 12-INCH, 16-INCH, 20-INCH AND 24-INCH CHILLED IRON CRANE WHEEL FLANGES UNDER STATIC LOADS WITH A SAFETY FACTOR OF FIVE



FIGS. 14-16—SAFE STRENGTH OF 30-INCH, 33-INCH AND 36-INCH CHILLED IRON CRANE WHEEL FLANGES UNDER STATIC LOADS WITH A SAFETY FACTOR OF FIVE

a certain amount. The data obtained in this first series of tests are tabulated in Table I.

The second series of tests were made on standard size wheels, 16 inches, 20 inches and 33 inches in diameter. In each of these diameters, wheels were tested having flange thicknesses of 1¼ inches, 1¾ inches, 2¼ inches and 2¾ inches, respectively, and for each of these thicknesses, wheels were tested having throat depths of 1¾ inches, 2½ inches and 3¼ inches. All wheels were tested to destruction, the load being applied through toggles. The point of application of the toggle was ½ inch above the tread of the wheels. The object of these tests was to determine the effect of varying the depth of the throat with each of the four flange thicknesses tested.

Other tests were made on 30-inch and 33-inch wheels with 1¼-inch flanges and with 5-inch and 1¾-inch, 2½-inch and 3¼-inch throats, respectively, with the point of application of the toggles ¼-inch above the tread. Tabulated results are shown in Table II. In the tabulated figures the load applied was borne by both flanges but the resolved forces are calculated for a single flange.

The results indicated that flange strength could be increased either by thickening the flange horizontally or by thickening the throat of the wheel. In round numbers, an increase of ½ inch in flange thickness was equivalent

(*Continued on page* 1110b)

Crane Wheel Facts

The vertical load carried on any wheel is limited by the carrying capacity of the rail.

Under like loads, the depression in the rail is inversely as the diameter of the wheel.

The power required for locomotion decreases as the diameter of wheel increases.

The strength of flanges increases with increase in wheel diameter.

The relation of flange thickness to throat thickness should be as two to three. In other words, every ⅛-inch added to flange thickness with the relative increase in throat thickness increases flange strength 25 per cent.

TABLE IV—SAFE STRENGTH OF CRANE WHEEL FLANGES WITH SAFETY FACTOR OF FIVE

Diameter Inches	Flange Inches	Throat Inches	Rail, Lb.	Strength
12	1	1¼	40	3,000
	1¼	1½	50	5,000
	1½	2	60	8,000
16	1	1¼	40	5,000
	1¼	1½	50	8,000
	1½	2	60	11,000
20	1	1½	50	8,000
	1¼	1⅞	60	11,000
	1½	2¼	80	15,000
24	1¼	1¾	60	12,000
	1½	2⅛	80	18,000
	1¾	2½	100	25,000
30	1¼	1¾	60	16,000
	1½	2	80	22,000
	1¾	2½	100	32,000
	2	3	100	47,000
	2¼	3½	150	69,000
33	1¼	1¾	60	18,000
	1½	2	80	24,000
	1¾	2½	100	35,000
	2	3	100	53,000
	2¼	3½	150	78,000
36	1¼	1¾	60	20,000
	1½	2	80	26,000
	1¾	2½	100	38,000
	2	3	100	56,000
	2¼	3½	150	86,000

TABLE V—DIAMETER AND WEIGHTS OF DOUBLE FLANGE CRANE WHEELS FOR VARIOUS LOADS AND FLANGE PRESSURES.

	Diameter of Wheel, Ins.	Weight, Pounds	Weight of Rail Used, Lbs.	Tread of Wheel, Ins.	Height of Flange, Ins.	Thickness of Flange, Ins.	Thickness of Throat, Ins.	Maximum Safe Flange Pressure, Lbs.	Maximum Safe Vertical Load, Lbs.
Single Plate Type	12	95	40	2⅛	¾	1	1½	3,000	4,000
	12	130	50	2½	¾	1¼	1½	5,000	7,000
	12	165	60	2⅝	¾	1½	2	8,000	11,000
	16	145	40	2¼	¾	1	1¼	5,000	7,000
	16	200	50	2½	¾	1¼	1½	8,000	11,000
	16	250	60	2⅝	¾	1½	2	11,000	15,000
	20	250	50	2¾	¾	1	1½	8,000	11,000
	20	325	60	3	1	1¼	1⅞	11,000	15,000
	20	400	80	3¼	1	1½	2¼	15,000	20,000
	24	415	60	3	1	1¼	1¾	12,000	16,000
	24	530	80	3¼	1	1½	2⅛	18,000	24,000
	24	640	100	3⅜	1	1¾	2½	25,000	34,000
Double Plate Type	30	650	60	3	1	1¼	1⅜	16,000	22,000
	30	760	80	3¼	1	1½	2	22,000	30,000
	30	875	100	3⅜	1	1¾	2½	32,000	43,000
	30	1,000	100	3⅜	1	2	3	47,000	63,000
	30	1,275	150	4⅛	1	2⅛	3½	69,000	92,000
	33	740	60	3	1	1¼	1¾	18,000	24,000
	33	850	80	3¼	1	1½	2	24,000	32,000
	33	1,040	100	3⅜	1	1¾	2½	35,000	46,000
	33	1,200	100	3⅜	1	2	3	53,000	71,000
	33	1,525	150	4⅛	1	2⅛	3½	78,000	104,000
	36	850	60	3	1	1¼	1¾	20,000	27,000
	36	985	80	3¼	1	1½	2	26,000	35,000
	36	1,200	100	3⅜	1	1¾	2½	38,000	51,000
	36	1,425	100	3⅜	1	2	3	56,000	75,000
	36	1,800	150	4⅛	1	3½	3½	86,000	115,000

New Forging Slotter

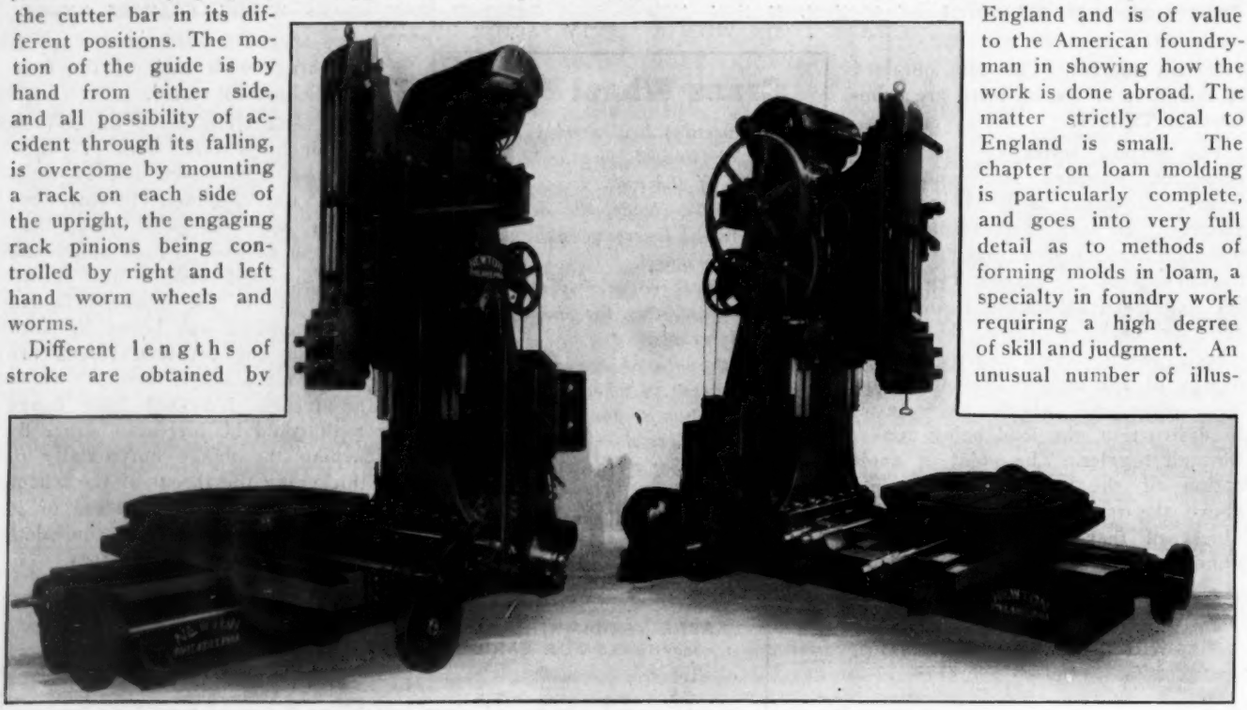
The Newton Machine Tool Works, Inc., Philadelphia, recently has brought out the heavy duty rack driven forging slotter shown in the accompanying illustration. This tool has several novel features, including the reversing motor drive, independent fast power traverse motion in both directions, push button control, operating levers on both sides with all levers connected to prevent engagement of conflicting motions.

The ram is of heavy box type construction and carries a relief tool apron having vertical and horizontal steel faced clamping surfaces. This ram is counterweighted and is supported by a guide which can be adjusted vertically properly to support the cutter bar in its different positions. The motion of the guide is by hand from either side, and all possibility of accident through its falling, is overcome by mounting a rack on each side of the upright, the engaging rack pinions being controlled by right and left hand worm wheels and worms.

Different lengths of stroke are obtained by adjusting dogs which trip an arm connected to the master switch. Hand control of the master switch is secured through a hand lever. The push button provided is so sensitive that it is possible to rotate the motor for such short intervals that the bar will not move more than 1/16 inches.

Variations in feed are obtained through a ratchet box which is rotated by a spur gear meshing with the main driving pinion. Engagement of the fast power motions and feeds to the table are controlled by levers. The main work table is octagonal in shape and gives the maximum clamping space possible within the range. This table is surrounded by a lubricant pan cast solid. The cross saddle is of exceptionally heavy box type construction with underlocking gibs cast solid.

The cutters are effective through a range from the minimum distance from the end of the work to the top of the table of 2 inches to a maximum distance of 54 inches. The distance from the cutter bar to the frame is 44 inches and work 42 inches in height can be accommodated under the bar supporting yoke. The minimum distance from the yoke to the table is 24 inches; work table is 54 inches across; length of in and out feed is 62 inches and the cross feed is 52 inches. The machine illustrated is arranged for a cutting speed from 15 feet to 30 feet per minute. It is driven by a General Electric type 25 horsepower motor.



FRONT AND REAR VIEWS OF NEW FORGING SLOTTER

A Great Record

The Lidgerwood Mfg. Co., New York, has built more than 37,000 steam and electric hoists during the 40 odd years that it has been in business. A comparison of the types of machines built today with those of 30 years ago still in operation is very interesting from an engineering standpoint as showing the improvements and advancement that have been made in hoisting machinery practice.

Manufacturers of grinding machinery and wheels claim that a good grinding wheel run at proper speed wears less during its passage over the work than a milling cutter under similar conditions.

Book Review

Practical Iron Founding, by Joseph G. Horne, A. M. I. Mach. Eng., fourth edition, revised and enlarged, D. Van Nostrom, New York. Furnished by THE IRON TRADE REVIEW at $2 net.

Practically double the matter in the previous edition is contained in the fourth edition. Great changes in iron founding have taken place since the first writing of the book, more particularly in machine molding, and much attention has been paid to this subject in the new volume. British and American molding machines are described at length, their operations analyzed, their application to various types of foundries described and their economies outlined.

The book is written and published in England and is of value to the American foundryman in showing how the work is done abroad. The matter strictly local to England is small. The chapter on loam molding is particularly complete, and goes into very full detail as to methods of forming molds in loam, a specialty in foundry work requiring a high degree of skill and judgment. An unusual number of illustrations, both drawings and halftone plates, renders the text the more valuable. The book is written for the student as well as for the practical man.

Drill Catalog

An interesting 219 page catalog has been issued by the Cleveland Twist Drill Co., Cleveland. A complete line of drill shanks, sleeves, sockets, etc., is described and illustrated, together with drills, reamers, etc. The catalog contains list prices and the prices of high speed steel tools are shown in red in contrast with the prices of the ordinary carbon tools which are printed in black. An interesting chapter on drill grinding is presented.

Eliminating the Dinner Bucket

A Discussion of the Advantages of the Mill Restaurant in Improving the Health and Vigor of Employes

BY EUGENE W PARGNY

THE usefulness of the time-honored dinner bucket, that universal emblem of the man who works with his hands, has failed to keep pace with the improvements made in many other lines in these days, when the human element of the man-machine is being given greater thought.

In consideration of the pay envelope the workman sells to the employer a portion of his bodily strength. He acquires that strength largely from the food supplied to him or, more correctly speaking, from that portion of food consumed which is, or can be, assimilated by the digestive system. To convert the food product into good red blood, then into muscle, nerve tissue and brain matter, the assimilative process draws from the individual a certain proportion of vital energy. The portion unassimilated because of unsuitable material, derangement of the internal economy, or by reason of some mental or physical stress, requires a further expenditure of vital force for its elimination from the system; and the balance, whatever it may be, represents the available or potential energy remaining within the individual.

The fundamental truth that food becomes such only to the extent that it is absorbed and utilized beneficially by the living body is well expressed in the familiar saying: "An army travels on its belly." The phrase implies not only that food is the one indispensible necessity in the rigors of an active campaign, overshadowing in its importance all questions of gunnery, tactics, equipment and perhaps even sanitation; but it implies also that the food must be selected with judgment and be suitably prepared. Field cooking today is given as profound study by military experts as fortification and the latest design of repeating rifle.

We have but to consider modern practice in the dining rooms of our public schools, in construction camps, in our city clubs and cafes, in coal mines, and—more than all—in our own homes, to realize that in order that the human machine may acquire therefrom a fresh supply of mental and bodily vigor, food must not only be wholesome and sufficient in itself but it must be palatable and inviting, and be partaken of in a contended state of mind. A solitary meal, eaten hurriedly, in some obscure corner of the plant, be the fare ever so inviting, is not productive of good results. What, then, may be said of the meal eaten amid the smoke and noise of the factory, with unwashed hands, wet clothing, and perhaps in the chilliness of winter, when the fare consists of the more or less sodden contents of a dinner bucket packed five or six hours previously.

The day laborer, the outside worker who has no fixed place of employment in the mill, is compelled to carry with him from place to place his implements of labor, his coat—and the inevitable dinner bucket. The latter, together with his coat, is usually to be found reposing upon some convenient pile near his work. The summer sun may beat down unmercifully upon it, or the icy winds may chill the modest fare within, but what of that? A dinner bucket is a dinner bucket. And so it be filled with a generous quantity of—something or other, what more does he ask? Nothing, perhaps. Nevertheless, the thought that that which is eaten does not always nourish recurs to one's mind with disquieting insistence.

The convenience and benefits accruing to the employe through the operation of the mill restaurant are much more widespread in character than

FIG. 1—MILL RESTAURANT, GARY WORKS, AMERICAN SHEET & TIN PLATE CO.

We are indebted to the American Iron and Steel Institute for this article. The author, E. W. Pargny is president of the American Sheet & Tin Plate Co.

FIG. 2—LUNCH ROOM, WORTH BROS. CO., COATESVILLE, PA.

FIG. 3—KITCHEN, GARY PLANT, AMERICAN SHEET & TIN PLATE CO.

might appear at first thought. For example:

When laboring overtime on breakdown or emergency work the employe can secure a full meal at his usual dinner hour.

Workers in exposed situations during severe weather can be refreshed by a portion of hot soup or coffee.

When exhausted by heat and physical exertion in warm weather, a refreshing draught obtained when most needed, frequently enables an employe to return to work with renewed vigor when otherwise he would be incapable of useful exertion for a considerable time. The aromatic bottled drinks furnished at practically all our restaurants seem to supply the necessary stimulation to overcome abdominal cramp among workers laboring in heated positions, the cramp being frequently superinduced by injudicious drinking of water when one is suffering from stomach derangement or careless exposure of the person to strong currents of air.

The burden of the housewife in the daily preparation of the dinner bucket, following the serving of an early morning meal, is eliminated. Where father and son have both to be provided for, as is often the case, the burden is by no means a light one.

When the wife is ailing or away from home, or sickness occurs among the little ones, the breadwinner may have to undertake the unfamiliar role of household cook—sometimes with disastrous results to his own internal well-being, not to mention that of his family. Where a mill restaurant is available, a half hour earlier start from the house secures him an inviting breakfast at a moderate cost.

An equally important consideration is the selection of the contents of the dinner bucket. The most desirable forms of food are not always adapted to packing, nor will they retain their freshness and palatability after standing for several hours in unsuitable temperatures, as is often their fate. It is not uncommon in rolling mills to see a large proportion of the contents thrown away because of its unpalatable or uninviting condition. As a further argument to prove the inadequacy of the packed lunch when put up by inexperienced housekeepers it may be stated that, not to speak of the questionable assimilative value of certain articles and combinations of food frequently found therein, fairly numerous cases occur of men who, after consuming the contents during the noon period, visit the restaurant in the afternoon to purchase a 10 or 15-cent meal.

For the unmarried men lodging in rooms—and especially those who do not, or cannot, obtain their meals at a boarding house—the higher prices obtaining in public restaurants is a condition not always easy for the young man to meet. Here again the problem of the dinner bucket has to be confronted, with the added difficulty, however, of getting the bucket filled with the things one likes, or that seem to best meet his particular requirements. The unmarried man and the foreign day laborer are usually good patrons of that section of the mill restaurant counter where such tasty items as fruit, cake or dessert provide a welcome addition to the somewhat monotonous fare of the boarding house.

The addition of a cup of hot coffee or other beverage obtained at the restaurant adds wonderfully to the satisfaction obtained from a lunch carried to the works, and this can be so easily prepared that there appears to be no good excuse for not providing

FIG. 4—SERVING COUNTER, LUNCH ROOM, ILLINOIS STEEL CO., JOLIET, ILL.

FIG. 5—DINING ROOM, ILLINOIS STEEL CO., JOLIET

such service in a greater number of plants.

The history of the mill restaurant in the works of the American Sheet & Tin Plate Co. dates back about ten years, when one day a small wooden structure made its appearance upon the grounds of one of the smaller plants. A modest cooking and dining equipment, some wooden tables and a plain board counter were put into place, a cook and attendant were secured, a spring wagon to transport supplies from the city was pressed into service—and the thing was done. The first mill restaurant was in existence!

Since that time similar service has been established for general use of the working forces in 12 plants. In two or three of the works offices, dining room service has been provided for the clerical force; while dining rooms and, in some cases kitchens, have been installed for the benefit of the women employed in the assorting rooms of those plants where tin plate is manufactured. Strange as it may appear, the pioneer work of the company along this line of welfare originated in some of the smallest of the plants whose total working population at that time ranged between 400 and 700 employes, while the latest installations have been made in Vandergrift and Gary plants, the working population of which are 3,000 and 2,000, respectively.

The buildings are erected and maintained by the company free of rental and without charge for any heat, light, fuel or water supplied. The company derives no revenue from the operation of the restaurants. The company insists, however, that the licensee or restaurateur shall supply good, clean, wholesome food at reasonable prices, and that the premises shall at all times be maintained in strictly high class condition in every respect. The mill management is charged with the duty of making frequent inspections of the condition and operation of the service. The fact that these expenses are not charged against the licensee enables him to make remarkably low rates considering the quality of the supplies and the nature of the service.

For those employes who cannot take time to come to the restaurant, arrangements have been made at some of the plants for freshly packed dinner pails and box lunches to be sent out to the mills. Hot coffee is also supplied. Experiments are now under way to determine the practicability of dispensing hot coffee and other liquids in thermos bottles in connection with the box lunches for the benefit of those who are engaged at more distant points at the larger plants.

To further enhance the value of the restaurant feature by making the surroundings cheerful and inspiring to our employes, garden plots and grass are being provided around the buildings where practicable, with covered benches, upon which to rest after eating. The design of future installations will include, where space permits, wide porches, where those who carry their lunches to the works and purchase coffee at the restaurant may enjoy their meal in comfort.

Is a Mill Restaurant Worth While?

The most convincing argument as to the success or failure of a plan is the measure of approval accorded by the individuals for whose benefit the movement is undertaken.

We have received many written expressions which have come to us from employes who take advantage daily of the facilities provided. In addition to these can be added hundreds of verbal statements favorable to the mill restaurants. A further substantiation of the popularity of the service is shown in the fact that out of a total of 3,000 employes in the Vandergrift plant an average of 600 meals are served daily, while the total combined sales of meal orders, refreshments and other edible commodities average over 2,000 transactions per day, Sundays excepted.

We believe that the mill restaurant as an economic investment has only begun its development; that the restaurant service will supplement to a large degree, if not supplant, the dinner bucket in all the works of this company in the near future; that a truer conception of the importance of suitably prepared and properly selected food will gradually extend from the plant to the homes of the workmen; and that absences from work on account of minor indispositions will be very largely reduced in consequence, and the earning capacity of the individual increased.

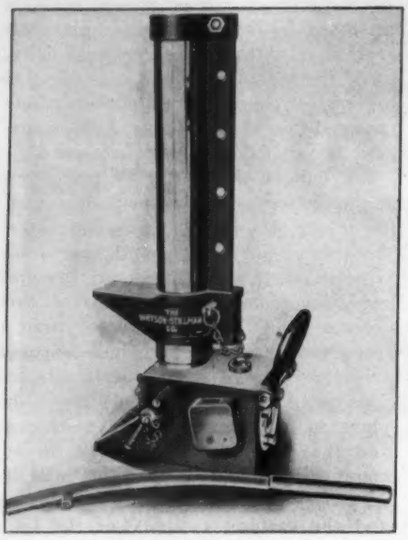
We believe the day is not far distant when the location and equipment of the mill restaurant, as a source of energy for the workman, will be as carefully planned as the power plant for driving the inanimate machinery.

FIG. 7—DINING ROOM, NORTON CO., WORCESTER, MASS.

FIG. 6—LUNCH ROOM, COMMONWEALTH STEEL CO., GRANITE CITY, ILL.

Boiler Economy

"Factors Governing the Combustion of Coal in Boiler Furnaces," is the title of a preliminary report published recently by the Bureau of Mines, department of the Interior. The report was prepared by J. K. Clement, J. C. W. Frazer and C. E. Augustine, and covers the subject of economical consumption of coal in boilers in a very thorough manner. It deals with the results of a large number of experiments on boilers which were conducted by the Bureau of Mines. Among the other factors considered in the report are the influence of air supply and rate of firing on the space required for complete combustion, the influence of the rate of pre-heating the coal and the thickness of the fuel bed.



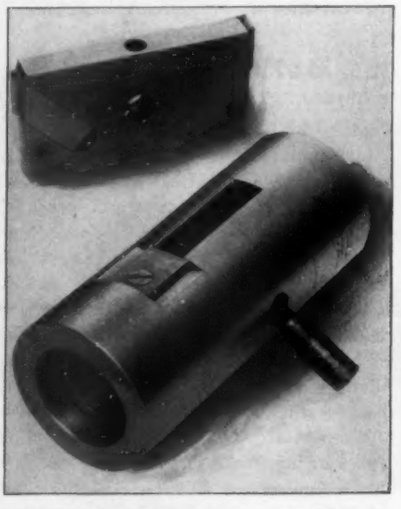
HYDRAULIC JACK

Hydraulic Jack

The Watson - Stillman Co., New York, has developed a new type of hydraulic jack. Although designed primarily as an emergency jack for street railway use, it is equally suitable for use in any shop or factory where lifting work is occasionally or constantly performed.

The claw can be moved vertically and adjusted to the most convenient height and with the cylinder can be swung in a complete circle without changing the position of jack or of the pump level. The cylinder is the moving part of the jack instead of the ram as in the ordinary type, thus allowing the pump mechanism to stay in a fixed vertical position. This permits the working parts of the jack to be made simpler and more compact than usually is the case. The piston is packed with leather rings; the valves are of the ball type, and all passages are made amply large with the result that the construction is said to be practically fool proof. The jack is operated with a special oil, which as well as acting as a lubricant prevents rust on working parts, the possibility of freezing and has no detrimental effect on the packings. Although the operating lever is but 18 inches long one man weighing 125 pounds can obtain the maximum pressure with but slight effort. The lever is curved and the socket has a hole in each of its four sides to allow convenience in operation from practically any position. These jacks are now constructed in 5 and 10 ton sizes with a ram stroke of 10 inches.

When the work is fed down to the drill, the chips fall out of the way naturally, and do not require forced lubrication.



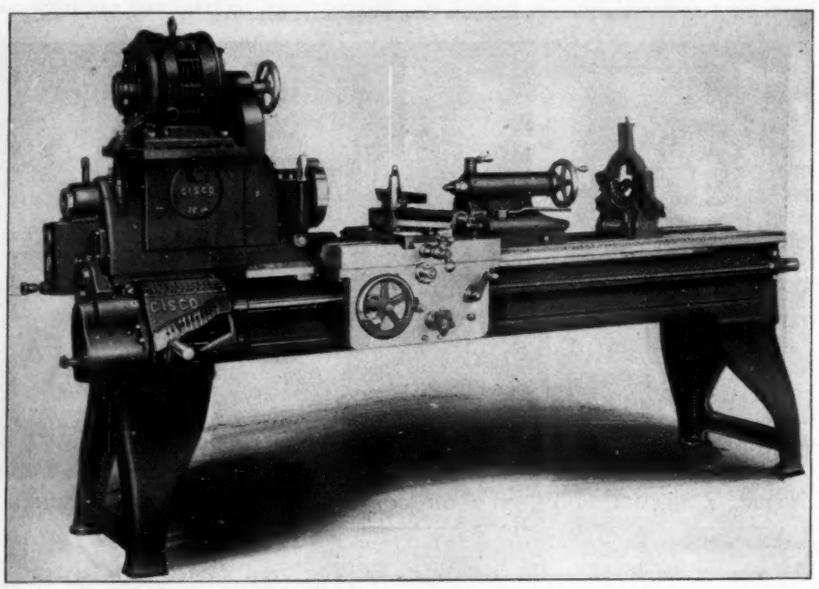
IMPROVED BORING OR REAMING HEAD

Improved Boring or Reaming Head

The accompanying illustration shows a boring or reaming head manufactured by the Kelly Reamer Co., Cleveland, in various sizes from 2½ to 6 inches in diameter. Boring bars or finishing reamers may be inserted in the head, giving a working diameter from 3 to 12 inches. The head is so arranged that pieces of shafting may be screwed into each end, making a lathe boring bar of any desired length. If the shafting is screwed into only one end, the head may be used as a large turret bar; with a tapered shank screwed into one end, it is converted into a vertical boring or reaming tool. The roughing and finishing reamers interchange in the slot in the head and are held in place by a tapered locking screw at the center. The tapered screw is tightened for the boring operation and loosened slightly for the floating reamer finishing operation.

New Motor-Driven Engine Lathe

The accompanying illustration shows a new 16-inch motor-driven engine lathe, which will be shipped to the Panama - Pacific exposition at San Francisco by the Cincinnati Iron & Steel Co., Cincinnati, O. The bed is 8 feet in length. This machine also is manufactured in two other sizes, namely, 14 x 8 and 18 x 10. The pull pin is arranged so that when it is in its neutral position the lathe can be run at high speed with all of the gears from the first compound out of mesh. This is especially desirable for filing and other work requiring high spindle speeds. The lock on the lead screw half nut is arranged so that it cannot be clamped too tightly. The bed is extra heavy and is made of semi-steel. This is said to insure practically permanent alignment. The motor is mounted over the head as shown in the illustration. The head itself has three speeds, two of which are controlled by a lever on the front of the machine while the third is obtained through the face gear.



NEW MOTOR-DRIVEN ENGINE LATHE

A good lubricant for turning, boring and milling aluminum is made of equal parts of lard oil and kerosene. Kerosene alone is also good, and cheap.

Conflicting Views Harmonized

At Meeting of American Society of Mechanical Engineers

And Important Conclusions Are Reached in Regard to Boiler Specifications—John Fritz Medal Presented to Dr. John E. Sweet

THE fall meeting of the American Society of Mechanical Engineers, held at the Engineering Societies' building, New York, Dec. 1, 2, 3 and 4, will be recorded in technical annals as the occasion on which the boiler specifications committee of the society, after working hard and constantly for 3½ years, to formulate a proposed boiler law and specifications which should eliminate the customary causes for explosions and the consequent serious loss of life and property, finally succeeded in harmonizing the efforts and views of the conflicting interests involved. To such an extent did this work of harmonization progress that the committee now is able to proceed to a final drafting of the proposed law and code, which, it now seems certain, will be submitted at the 1915 spring meeting as the expression of the great majority of boiler makers, inspectors and users. The committee presented a progress report on the first day of the convention, announcing through its chairman, John A. Stevens, that it was ready to receive all criticisms and suggestions. So active was the opposition to the work of the committee that for a time it appeared doubtful whether the close of the convention would find the committee still in existence; a number of prominent steam engineers formulated and introduced a motion which asked for a discontinuance of the committee and its work. After a good deal of argument, followed by the committee's assurance that it was willing to compromise on the various provisions of its report to conform to the will of the meeting, this motion was overwhelmingly defeated. The boiler specifications committee then took up each section of the proposed code and submitted it for open discussion. The treatment of the code in this thoroughgoing manner was conducted in separate session, and did not end until the termination of the convention Friday noon, the discussion continuing each day until far into the night. The result was that the argument on the committee's report, which began in an excited fashion, finally became characterized by a spirit of friendly and unselfish co-operation on the part of all who took a part in it. Practically every paragraph and sentence in the code was changed, amended or modified, to some extent. Not all the provisions of the code yet are settled; in a few cases, certain matters have been submitted to engineers who will forward written reports to aid the committee in settling doubtful points. The committee, along with the presentation of its report at the spring meeting, it develops, will suggest that it be continued as a standing committee of the society, to make a progress report each year.

There is reason to believe that the report of the boiler specifications committee, when it assumes final form, will be accepted by the society insofar as the proposed code is concerned. Practically all the engineers who are interested in the subject were agreed that it is essential, under modern conditions, to have such a code. It is doubtful, however, whether the proposed laws, model engineers' and firemen's license and the model boiler inspection, as drawn up by the committee, will be approved, as a number of prominent engineers expressed themselves at the meeting as questioning the propriety of any attempt on the part of the A. S. M. E. to formulate proposed legislation. Inasmuch, however, as the harmony which finally resulted in the discussion of the proposed code grew out of such an inauspicious beginning, it is possible that the sentiment of the society in regard to the proposed laws also may undergo as radical a change.

Activity of Committees

A feature of the convention is that of the various papers read, five were presented by committees, thus indicating increased activity on the part of these branches of the society. On purely iron and steel subjects, only three papers were presented. There was considerable discussion on the subject of reinforced concrete factory buildings, and as to the types of floors which prove most serviceable. There were interesting papers on standardization and efficiency work in manufacturing plants. On the whole, the amount of technical literature added to the proceedings of the society during the convention, was not as large as at other conventions. Neither was the discussion of the papers as lively as usual.

An important feature of the convention was the "Public Service Meeting", at which the papers and discussions related to the subject of engineering in the administration of a city. This meeting stretched through a day and a half. It was opened on Thursday morning by Mayor John Purroy Mitchel, of New York, who addressed himself to the important part which the engineer now is playing in the government of municipalities, particularly New York. New York City also was represented at this meeting by Henry Bruere, city chamberlain, who read an interesting paper on "The Future of the Police Arm from an Engineering Standpoint". Other papers read at the Public Service meeting were "Some Factors in Municipal Engineering", by Morris L. Cooke; "The New Charter for St. Louis", by Edward Flad; "The Engineer and Publicity", by C. E. Drayer; "The Design and Operation of the Cleveland Municipal Electric Light Plant", by Frederick W. Ballard; "The Handling of Sewage and Sludge", by Geo. S. Webster; "Training for the Municipal Service in Germany", by Clyde Lyndon King; "A Study of Cleaning Filter Sands with No Opportunity for Bonus Payments", by Sanford E. Thompson, and a committee report on "Snow Removal".

Presentation of Fritz Medal

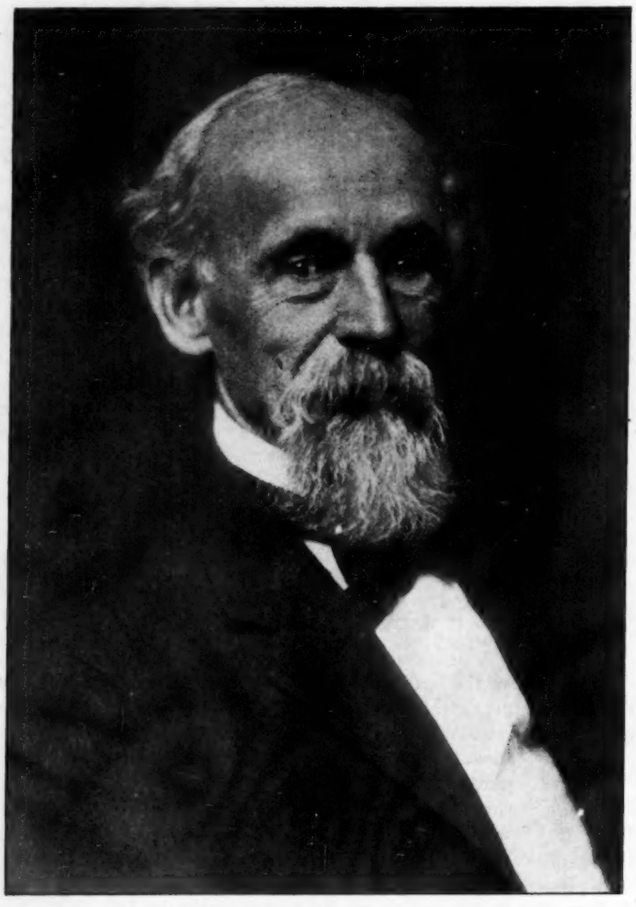
The presentation of the John Fritz Medal was the occasion of an impressive ceremony on Wednesday evening. Following addresses by Dr. Jas. Douglas, honorary member of the society and past president of the American Institute of Mining Engineers, and Dr. S. W. Stratton, director of the Bureau of Standards, representatives of the four engineering societies, the American Society of Civil Engineers, American Institute of Mining Engineers, American Institute of Electrical Engineers and the A. S. M. E., which participate in the award of the medal, took their places on the platform. Gano Dunn, president of the John Fritz Medal Fund Corporation, presented the medal, while the presentation address was delivered by John R. Freeman. After sketching the history of the John Fritz Medal and recalling the eminent engineers who have been honored by receiving it, he turned to Dr. John E. Sweet, this year's recipient.

"Tonight," said Mr. Freeman, "it is to be bestowed upon the one who

Mechanical Engineers Chose John A. Brashear as Head

New Executive Has Attracted World-Wide Attention by Genius in Developing Astronomical Instruments—Improvement of Spectroscope Due to His Efforts

John A. Brashear, newly-elected president of the American Society of Mechanical Engineers, was born in Brownsville, Pa., in 1840, and educated in the public schools. He learned the machinists' trade and from 1860-1870 worked in the rolling mills of Pittsburgh. The study of astronomy, however, had been his hobby from boyhood, and all his spare time was devoted to it. In 1870 he attracted the attention of Langley, they head of the Allegheny Observatory, and through the assistance of William Thaw, one of the observatory patrons, set up a shop in Allegheny for the manufacture of astronomical instruments. In a very short time he became widely known as an expert in the development and manufacture of astronomical instruments of precision, and it is safe to say that a history of the work of his shop would closely approximate the history of astronomy during the last 30 years.



JOHN A. BRASHEAR,
New President of American Society of Mechanical Engineers

Perhaps his most important achievement has been in connection with the design and development of the spectroscope for astronomical uses, particularly with reference to the mechanical features. In 1888 he completed the spectroscope for the 36-inch telescope of the Lick Observatory, furnishing the mechanical parts, and at the same time a complete small spectroscope, including the prisms and all other optical parts. The excellence of the work which has been done by Professor Keeler at the Lick Observatory is freely attributed to Dr. Brashear's skill and genius and many of the spectroscopes in the principal observatories of the world have been designed and built by his firm.

Dr. Brashear's more purely scientific work also brought recognition and about the time of his removal to Allegheny he was given an appointment in the University of Western Pennsylvania, of which Allegheny Observatory was a department. From 1898 to 1900 he was acting director of the Allegheny Observatory and has always kept in touch with its development, and through his efforts it has been put in every possible way at the disposal of the public. For a number of years past Dr. Brashear has also been a trustee of the Carnegie Institute of Technology, and it is said that he has done more for the cause of education in Pittsburgh than any three other men. Several years ago a friend placed in his hands an endowment fund of $250,000, to be used for the advancement of the public schools, as a result of which 600 teachers have been sent to different parts of the country for rest and study, bringing back with them new ideas and greater enthusiasm.

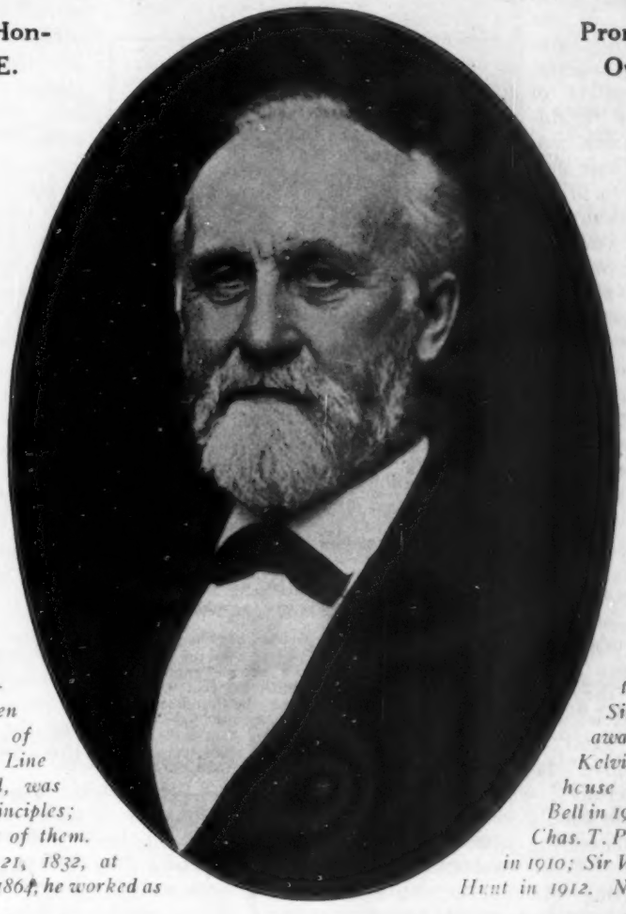
Dr. Brashear is a fellow of the American Association for the Advancement of Science and Royal Astronomical Society of Great Britain; is a past president of the Engineers' Society of Western Pennsylvania and the Pittsburgh Academy of Arts and Sciences; and is a member of the British Astronomical Association, the Societe Astronomique de France, the Societe de Belgique, the American Philisophical Society, the Astrophysicay Society of America, the National Geographic Society, and an honorary Member of the Royal Astronomical Society of Canada. He has been honored with the degree of LL.D. by Washington and Jefferson College and by Wooster University, and with the degree of Sc.D. by Princeton University and the Western University of Pennsylvania. He was made an honorary member of the American Society of Mechanical Engineers in 1908.

more than any other one man now living brought about the forming of the American Society of Mechanical Engineers, to one who for years as a college professor quickened the life and interest of many men now no longer young, to one who pioneered in high speed steam engine building and taught the necessity of precision of workmanship and of opposing a stress with metal placed directly along the line of force if one would double or treble the work to be performed per pound of metal."

Mr. Sweet, among whose characteristics is that of modesty, expressed his appreciation of the honor very briefly and simply.

Dr. Sweet Wins Famous Medal

Noted Engineer is Honored by A. S. M. E.



Prominence Extends Over Many Years

THE prominence of Dr. John Edson Sweet, to whom was awarded the John Fritz Medal for 1914 at the New York convention of the American Society of Mechanical Engineers, dates from his connection with the Sibley College of Mechanic Arts of Cornell University, in 1873. Although he remained with that institution only until 1879, he rose in that brief period from a position of obscurity to one of prominence, which ever since he has maintained. He was the originator of a new type of construction in this country, which since has been widely adopted in all lines of manufacture. The Straight Line engine, which he developed, was an embodiment of these principles; in fact, a perfect illustration of them. Dr. Sweet was born Oct. 21, 1832, at Pompey, N. Y. From 1862 to 1864, he worked as a mechanical draftsman in England. Returning to this country, he engaged in bridge building and later accepted the professorship at Cornell. On leaving that university, he incorporated the Straight Line Engine Co., Syracuse, N. Y., of which he continues the head. He was one of the founders of the A. S. M. E. and was its third president. The John Fritz Medal, of which Dr. Sweet is recipient this year, was founded by friends and admirers of the late John Fritz and first was presented to the latter in the year 1902. Since then the medal has been awarded as follows: To Lord Kelvin in 1905; George Westinghouse in 1906; Alexander Graham Bell in 1907; Thos. A. Edison in 1908; Chas. T. Porter in 1909; Alfred Noble in 1910; Sir Wm. White in 1911; Robt. W. Hunt in 1912. No award was made in 1913.

Elimination of Seams

Capt. Robert W. Hunt, Chicago, presented a paper on "The Mechanical Elimination of Seams in Steel Products, Notably Steel Rails", which will be found, substantially in full, elsewhere in this issue.

In discussion of Captain Hunt's paper, Leonard J. Hibbard was of the opinion the author had presented a cure for a condition which should not exist. Mr. Hibbard said he believed in good steel and that the use of such steel makes it unnecessary to use the milling process. The real solution of the problem, he said, is to start with sound ingots. Another speaker, who had witnessed a demonstration of the milling process at the Lackawanna Steel Co.'s plant, acknowledged that the milling process removed only surface defects and that it, therefore, was necessary to have good steel to work on; by removing the surface defects, however, he said, a great many rail troubles can be eliminated by the milling process. In replying to another speaker, Captain Hunt said that the process has not and will not be applied to the webs of the rails, but only to the flanges and heads. He said it is proposed to extend the use of the milling process to stock for axles and other high grade work.

Standardization of Wheels

F. K. Vial presented a valuable paper on the "Standardization of Chilled Iron Crane Wheels". The troubles commonly encountered with crane wheels, he said, are: Wheels becoming out of round on account of unequal wear, breaking down of metal on account of loads exceeding its bearing power, destruction and binding of flanges on account of irregularity in gage of track. Furthermore, said the author, these defects in wheels produce heavy strains throughout the crane structure, including worn and broken propelling gears. Mr. Vial described a series of tests of crane wheels undertaken by the Griffin Wheel Co., which made use of a 300,000-pound Riehle testing machine. Among other things, these tests established that the vertical load to be carried on any wheel is not limited by the capacity of the wheel, but by the carrying capacity of the rail; the bearing power of chilled iron is far in excess of that of a steel rail; the power required for locomotion decreases as the diameter of wheel increases; the strength of flanges increases with the increase in diameter of wheel. The tests showed that the relation of flange thickness to throat

thickness for crane wheels should be as two to three. The paper was accompanied by tables showing the maximum safe vertical load and the maximum safe flange pressure for double flange wheels ranging from 12 to 36 inches in diameter.

Hardening Tool Steel

John A. Matthews and Howard J. Stagg Jr., of the Halcomb Steel Co., submitted a paper devoted to a discussion of the various factors which enter into the hardening of tool steel, the discussion referring primarily to high carbon steels and to such steels as contain a small percentage of alloying elements. The authors took up the phenomenon of dilatation, the time of heating, speed of quenching, and the quenching capacity of the various liquids used customarily, also the effect of mass upon the penetration of hardness and the effect of mass upon surface hardness in different sized pieces of the same material, illustrating the latter by new experimental data. They set forth the effects of time and temperature in drawing the temper, the resulting hardness changes, the change of shape due to hardening and the property of resistance to change which some steels possess. They recommended for the attention of hardeners, the numerous variables which often cause irregular, erratic and discordant results. They also emphasized the importance of employing adequate equipment in securing good results from the hardening operation.

Measuring Efficiency

"Measuring Efficiency" was the title of an interesting paper by H. L. Gantt. The author objected emphatically to the attempts which have been made by cost accountants during the past few years to express managerial efficiency of railroads by the ratio of "non-productive" to "productive" labor. Mr. Gantt cited numerous instances to prove that this ratio should receive no consideration in measuring efficiency.

Fred J. Miller, in discussing Mr. Gantt's paper, expressed himself in favor of not limiting the overhead expense in manufacturing operations, since a high overhead cost, he said, generally results in lower labor costs.

H. K. Hathaway expressed the hope that the economics of business some day will be regulated as scientifically as any exact science now is by natural laws.

Operation of Grinding Wheels

George I. Alden, Worcester, Mass., submitted a paper on "The Operation of Grinding Wheels in Machine Grinding", which included interesting data in regard to the cutting power of the abrasive grain in the wheel, as determined by the diameter of the wheel, the diameter of the work and the speeds of the wheel and the work. His results, said the author, were obtained from purely theoretical considerations and are based on the principle that the successful working of a grinding wheel depends upon securing in its operation the correct grain depth of cut for that particular wheel on a specified kind of work. The grain depth of cut he defined as the quotient of the radial depth which the wheel cuts into the work, divided by the number of cutting grains or particles in action at one time. This grain depth of cut, he said, is the controlling factor in securing the correct working of the wheel and he submitted formulae for computing the grain depth of cut as well as the speeds and diameters of wheels which are most desirable in certain kinds of work.

G. W. Dickie, A. S. M. E.

G. W. Dickie, vice president of the American Society of Mechanical Engineers, was born in Arbroath, Scotland, July 17, 1844, and was educated at Tayport, Fife. From 1860 to 1864 he served a special apprenticeship in the locomotive and marine shops of the Edinburgh, Perth and Dundee railway, now known as the North British railway, serving an additional two years in the construction of spinning mill machinery at Monifieth, Scotland. He was employed in the shipyard of Wm. Dickie & Sons, Tayport, Scotland, from 1866 to 1869.

In 1869 Mr. Dickie came to the United States and was employed as an engineer for the Risdon Iron Works of San Francisco, where besides having charge of the marine work he took a leading part in the design and construction of the heavy machinery for the Comstock mines. He subsequently became engineer-in-chief of the Risdon Iron Works and remained in their employ until 1883, when he became director and manager of the newly formed Union Iron Works Co. During his connection with this company 23 war vessels and about 60 merchant vessels were built, in addition to other large undertakings.

Since 1905 Mr. Dickie has been engaged in consulting work for the most part in connection with marine engineering and naval architecture in San Francisco. He superintended the building of the steamer President at the yard of the New York Shipbuilding Co., and the design and construction of the steamers Governor and Congress.

P. F. Walker and W. J. Malcolmson, Lawrence, Kansas, discussed experiments which have been carried on in the mechanical engineering laboratory at the University of Kansas during the past three years in determining friction losses in universal joints designed for automobile transmissions, testing such joints under the conditions of load and speed which are common in service. The loads were measured by electrical methods, the joint being placed between two machines operating as motor and generator, on the "load back system". The results showed high efficiency excepting at large angles and high speeds and the losses were nearly proportional to the power transmitted for loads above one-fourth of the rated capacity of the joint.

Concrete Factories

F. W. Dean, Boston, submitted a paper on "Reinforced Concrete Factory Buildings", which, in addition to the advantages, set forth some of the disadvantages attendant upon reinforced concrete construction. The use of this material, he said, results in buildings of maximum resistance to fire and in having a maximum amount of natural illumination due to the greater window area which is made possible. Mr. Dean, however, pointed out that regular mill construction buildings have shown great fire resisting properties when properly designed. He discussed the various methods of finishing the floors in concrete buildings and recommended the application of wood as a wearing floor above the concrete.

In discussing Mr. Dean's paper, J. P. H. Perry showed lantern slides of a large number of concrete factory buildings, including those at the Bush terminal in Brooklyn, the plant of the Robert Gair Co., and others. The latter company, which now is erecting what will be the largest concrete factory building in the world, said Mr. Perry, has found by experience that it can operate its machinery at greater speed in concrete buildings than in those of mill construction. In regard to the use of wood floors in concrete buildings, he stated that at the Bush terminal the plant of covering all floors with maple has been abandoned and the floors now are of the granolithic type.

Floors of Fireproof Buildings

Sanford E. Thompson, Boston, in a paper entitled "Flooring Surfaces in Fireproof Buildings", said no one type of floor surface is adapted to all conditions. He discussed various kinds of floors, the cost of construction and the kind of service which can be expected of each. Granolithic floors, he said, are subject to dusting and, under heavy traffic, to serious wear. Experience, however, shows that it is possible by proper selection of the aggregates and expert workmanship, to reduce the dusting to an insignificant amount and produce a surface hard enough to stand even severe wear. A granolithic floor which will wear well and present a pleasing appearance, can be obtained by grind-

ing the surface just enough to expose the grains of sand and stone. The hardness of granolithic floors, he recommended, should be overcome by the use of battleship linoleum. In regard to wood surfaces, he said that these usually are not considered entirely satisfactory, either in general appearance or wearing qualities.

In discussing this paper, Ross Tucker stated that he much preferred the use of wood floors to uncovered cement or granolithic floors, since the former were less tiresome to employes in the plant. He said that due to the rapidity with which these floors conduct heat, the men who work on them usually suffer with cold feet, lame back, etc., in cold weather. Leonard Wasson declared that the latter difficulty could be eliminated in one of two ways: By heating the floor or by wearing heavy shoes.

Volume Regulators

In a paper entitled "A New Volume Regulator for Air Compressors", Ragnar Wikander of the Hall Steam Pump Co., Pittsburgh, reviewed the features of previously existing types of volume regulators, after which he took up the new regulator which recently has been put on the market by the Hall company. In this regulator, the amount of intake air for air compressors is regulated by automatic or poppet type valves. To decrease the amount of intake air, the suction valves are kept open by force during a part of each discharge period, thus allowing a portion of the air which has been drawn into the cylinder during the suction period to return through the suction valves; the valves close as soon as the amount of intake air remaining in the cylinder is decreased so as to correspond to the amount of compressed air required at the time. The closing of the automatic valves is effected by a very gradual regulation of the force holding the valves open against the pressure exerted by their springs. The return flow of the air or gas through the valves produces a pressure tending to close them and this pressure increases constantly until the piston has reached the end of its stroke, or nearly so. The valve closes at a point where this pressure, supported by the pressure of the valve springs balances and overcomes the force applied for the purpose of regulation. With the exception of steam-driven duplex and cross-compound air compressors, said the author, there are few cases where this new regulator cannot be applied to advantage. The results attending its application to natural gas compressors, he said, are particularly satisfactory.

Clinkering of Coal

Lionel S. Marks, Cambridge, Mass., in a paper entitled "The Clinkering of Coal", described investigations he has conducted in determining what characteristics in coal give the greatest trouble due to clinkering. His investigations showed that ash with a fusing temperature below 2,550 degrees Fahr. probably will give trouble is the ash has a fusible constituent, whereas it will not give trouble with a fusing temperature above 2,515 degrees Fahr., if the ash is viscous. Mr. Marks employed a variation of

GEORGE W. DICKIE,
New Vice President A. S. M. E.

the Seger cone method in carrying on his investigations.

Various Topics

The sub-committee on railroads submitted a report on "Steam Locomotives of Today" which was discussed in a separate meeting. There was an informal cement session in which a paper by J. Benton Porter on "Electric Drive for Chemical Operation and Development of Cement Mills" formed the basis of discussion. Other papers submitted at the convention were "A Rate-Flow Meter", by H. C. Hayes; "Laboratory for Testing and Investigating Liquid Flow Meters of Large Capacity", by W. S. Giele; "Physical Laws of Methane Gas", by P. F. Walker, and "Standardization in the Factory", by C. B. Auel. The latter paper was devoted to a general description of the ways and means employed by a large electrical establishment in working out a system of standardization in its manufacturing methods.

The committee on constitution and by-laws announced that amendments to the constitution as announced by ballot at the spring meeting in Minneapolis, now are in effect. These provide that any individual to be eligible for membership shall be an engineer or teacher of applied science, of 32 years of age, shall have been in the active practice of his profession for at least 10 years, shall have been in responsible charge of important work for five years, and shall be qualified to design as well as to direct engineering work. An associate member shall be a professional engineer not less than 27 years of age, who shall have been in active practice for at least six years and shall have had responsible charge of work for at least one year.

The finance committee's report indicated that the society continues one of the wealthiest organizations of its kind in the world. The income for the year ending Sept. 30, 1914, was $125,454.11, and the total expenditures chargeable to income, $116,001.67, leaving an excess over income of $9,452.44. Appropriations for the current year aggregate $116,660, while the income is expected to be about $130,500.

The membership committee reported that it took action on 1,521 applications for membership during the year. Of these applicants, 1,318 were recommended for membership. The cost of getting the new members during the year was at the rate of $1.63 each, compared with $3.78 the preceding year, and $5.14 in 1911-1912. During the year, a woman was taken into membership for the first time in the history of the society.

Jesse M. Smith presented a resolution embodying a proposed change in the constitution. This provides for the addition to the committees of the society of a standing committee which shall supervise the work in standardization which is conducted by the other committees. This was accepted for reference to letter ballot. Another resolution which was accepted for reference to letter ballot provides that the publication of the journal, and its continuance according to present policies, be referred to a special committee.

Social Features

Provision was made in the program for the usual college reunions, which were held on Friday evening. Thursday evening was devoted to a dinner dance at the Hotel Astor. Entertainment features were provided in abundance for the visiting ladies.

Improved Outlook in England

With a Good Buying Movement in Finished Lines—Belgian Refugees Go to Work at Yorkshire Furnaces

Office of THE IRON TRADE REVIEW,
Prince's Chamber's, Corporation, St.,
Birmingham, Eng., Nov. 24.

Severe weather has imposed a lull upon war operations in the western battlefield, trench digging being impossible in the frozen ground, while all the combatants explain their small achievements through the intervention of "General November". The operations of Russia are telling with more deadly effect, and the flow of refugees from East Prussia to Berlin will necessarily tell its own story in the capital and will take a good deal of explaining away. Recruiting is still going quietly forward here, notwithstanding the arduous conditions which winter recruits have to expect. It is now established that the great war loan has been enormously oversubscribed, while the general trade outlook continues to improve. From Germany comes rumors of shortage of copper and other metals, while board of trade inquiries show that 555 enemy vessels are sheltering in neutral ports as the result of the war. There is a decided shortage of ships in this country, and it has been suggested that all merchant ships which have become prizes of war shall be promptly sold, so as to be utilized for the carrying of merchandise. It is hoped that the government will consider this. The Clyde shipyards continue busy, and among other commitments are a number of steamers for the Atlantic traffic ordered by the Canadian Pacific Steamship Co. Generally, the outlook is decidedly brighter. An interesting financial item is the lending by the government of £18,000,000 to the Australian commonwealth, a large part of which will be used for the carrying out of important public works and will thus assist to swell the general current of trade.

The Cleveland pig iron market has shown a further slight recovery, yesterday's quotation being 51s 1d ($12.06), or something like 8d (16c) above the figure at the end of last week, and about 1s 3d (30c) on the minimum. But, so far, sales are chiefly for urgent needs, although there is a better inquiry for forward contracts. Makers, however, are now asking 52s ($12.48) on forward business, and they state that this figure would leave profits cut very finely, in view of the high working costs. The output is being restricted somewhat in the Cleveland district, owing to the scarcity of men. Trade also is being hampered a little by the difficulty of sending iron to Scotland along the sea routes, in consequence of the admiralty restrictions on the Firth of Forth as well as in the mouths of the principal rivers. All things considered, the shipments have been clearly satisfactory, the loadings since the beginning of the month being 41,000 tons. A great deal of iron has been sent by rail in view of the exceptional sea difficulties. Stocks have slightly decreased and now stand at 102,000 tons. Hematite has been very seriously affected by the government's prohibition as applied to certain countries, and this has helped to weaken prices. Still British buyers are taking fair quantities for forward requirements. Other markets have been favorably affected by the Cleveland improvement, and buyers of Northamptonshire and Derbyshire iron are more disposed to do business than they have been for some time. Makers, apparently, are not stocking much metal, and the circumstances appear more favorable to an upward movement. Makers of hematite expect to benefit by the rise of 5s declared in the price of Northeastern steel plates and angles. The consumption of material at Sheffield is enormous, and fancy prices would be demanded if the normal business were maintained, in addition to the heavy war demand. A very interesting development is the engagement of a number of the Belgian refugees at Yorkshire furnaces to take the place of Britishers who have gone to the war. It is thought quite likely that many of these men will settle permanently in the country. An element which will help to lift pig iron prices is an advance of 1 shilling declared in the price of coke; still further advances are expected.

Finished Iron and Steel

It may be that the better reports from America have assisted the improvement, but on all hands it is agreed that the outlook is better. There has been a good general buying movement, one of the effects of which was a decision by the Scottish and English steelmakers' associations, at a meeting in London on Friday, to authorize makers in the northeast of England to advance their prices for ship plates and angles by 5s per ton. This makes the former £7 10s and the latter £7 5s. Makers have now very good order books. Port Glasgow shipbuilding firms last week secured contracts for 50,000 tons of new work, mainly tramp steamers. There are many other good inquiries in the market, and the freight position is giving considerable encouragement to shipbuilding enterprise. All the foreign buyers have placed orders somewhat more liberally in the Scotch market. India especially has been a good buyer of black sheets. The Sheffield works are producing armor, guns and shells in record yuantities, and, to secure fullest production, a special three-shift system of eight hours each has been established, while numerous extensions are being made. The output of Siemens-Martin steel is decidedly below the demands, and in consequence of the resolute attitude o fthe government, which has insisted on commandeering the whole of the output of certain leading works, a number of the ordinary customers for steel employed for pacific purposes are obliged to go short. Very heavy orders have been placed for shovels, picks, axes, etc. Apparently, the government requirements are growing conformally to the steady increase of the army. Sheffield is turning out large quantities of crucible steel employed in aeroplanes and vanadium steel for armed motor cars. Certain bayonet-making plants have been obliged to undertake considerable extensions. The makers of high-speed steel are not only supplying large quantities to the government, but are finding a steady expansion of general demand. In the half finished department, more lots of American billets have been on offer, but prices are rather too close for British quotations to offer much advantage. On the Manchester market, English 2-inch billets are offering at about £5 12s 6d.

In the rail department, there are signs of a new buying movement, and some very good tramway rail orders have been placed, while the railway companies are buying rolling stock a little more freely. An interesting inquiry has been from the French government for a special kind of steel, which it is thought may eventually have to be purchased from America. A very curious minor development is a record demand for needles.

Business News from the Capital

New Order of Interstate Commerce Commission Expected to Clear Up Confusion in Regard to Pig Iron Rates From Southern Points

Washington, Dec. 8.—Confusion growing out of the decision of the Interstate Commerce Commission in the Sloss-Sheffield pig iron rate case is expected to be eliminated as the result of an order entered last Thursday by the commission.

Action was taken by the commission, first, for further investigation and hearing as to the reasonableness of certain rates on pig iron from Alabama and Tennessee blast furnaces to points in Central Freight Association, trunk line and New England territories, included in Official Classification territory, not covered by the order entered in the original complaint; second, for further investigation and hearing on the issues presented in the supplemental complaint filed by Attorneys Wimbish & Ellis, representing the shippers, and third, to fix the proper divisions of through rates established by the defendant carriers. The previous order is to remain in full force, and hearings on the reopened case are to be held at such times and places as the commission may direct.

In entering the second order, the commission means 361 carriers as additional defendants, representing all of those involved in any manner in transporting pig iron from the Alabama and Tennessee furnaces to the points of destinations throughout Official Classification territory.

It will be recalled that, following the decision, only those lines made defendants at first filed tariffs established reduced rates ordered. Subsequently some lines not made defendants did make reductions to Cincinnati. With this condition prevailing the whole pig iron rate structure from the southern furnaces was upset. It resulted in certain identical points getting the new and lowered rates over the lines of defendant carriers, and the old and higher rates over lines not made defendants. Moreover, it is contended in the supplemental complaint that the carriers did not comply with the order of the commission in numerous respects and refused to lower rates to certain points which the commission clearly meant should have reduced rates. It was the object of the supplemental complaint to straighten out these conditions. The petition asking that the commission fix divisions between the carriers was filed by the southern lines made defendants, but they do not suggest any specific divisions, merely citing that the northern and southern lines have been unable to agree as to the divisions. The northern lines are understood to have asked that the southern lines bear the entire burden of the reductions, a contingency which the latter have refused to comply with.

Not only did the commission name as additional defendants those suggested by the supplemental complaint, but it acted upon its own initiative and broadened the list to include all lines which participated in any way in the traffic to the territories affected.

Will Complete Dock

Washington, Dec. 8.—A supplemental contract has been signed with the San Francisco Bridge Co. for completion of the naval dry dock at the Pearl Harbor naval station, Hawaii. When the bottom heaved about two years ago work on this dock was suspended. The new contract calls for completion of the dock by July 1, 1918, for $1,261,350, which is $238,650 less than the amount made available by Congress. The basin will be larger than originally contemplated—1,029 feet long, 148 feet wide at the top and 35 feet deep over the sill at mean high water. The total price now is $4,452,115, exclusive of the cost of the caissons, pumping plant, and other features provided by the government.

Types of Armor Plate

Washington, Dec. 8.—Experiments to determine the relative value of different types of armor plate show the existing type to be superior to all others according to the annual report of Rear Admiral Joseph Strauss, chief of the Bureau of Ordnance, Navy Department.

Admiral Strauss is secretary of the commission which is making an investigation as to the feasibility of the government erecting its own armor plate plant. His statement is therefore given added interest.

Recommendation is made by Admiral Strauss that a cash reward be provided for civilian employes of the naval gun factory, who may work out improvements either in manufacturing process or design, from which the government may profit. Some difficulty is experienced, the admiral says, in keeping the cost of steel castings made at the Washington gun factory down to an acceptable figure. This is ascribed to the fact that the work at a government plant must necessarily be more or less fluctuating, "and this bears especially heavily on a steel foundry. The report says it is hoped to assign additional work to the yard in the near future of such a nature that its manufacture can be carried on when opportunity presents and thus provide a steady flow of work without delaying the needs of the service."

The old foundry has been dismantled and the new foundry put in operation. This portion of the plant is able to turn out castings of the largest size required for ordnance work in steel, cast iron and bronze.

Rear Admiral R. S. Griffin, engineer-in-chief of navy work, reports that the engines for the dreadnaught New York were quickly constructed at the New York yard at a cost somewhat less than they could be procured by contract, and the workmanship was unexcelled. On the west coast, it is stated, even more satisfactory results were obtained for Mare Island navy yard which completed the machinery for the gunboats Monocacy and Palos well within the estimates. The final cost is said to be little more than two-thirds of the amount bid by private firms.

Discussed Coke Making

A discussion of coke making by the beehive and by-product methods, featured the monthly meeting of the Newark Foundrymen's Association, held at the Washington Restaurant, Newark, N. J., Wednesday evening, Dec. 2, which was attended by about 40 members. The subject of "Beehive Coke" was presented by W. G. Ireland, of Pittsburgh, sales manager of the Jamison Coal & Coke Co., who explained in detail the various steps in the manufacture of coke by this method. He stated that complaints from foundrymen as to poor results with certain cokes frequently were the fault of the former rather than of the fuel due to improper practice. C. M. Schwerin, president of the Vinton Colliery Co., 1 Broadway, New York City, presented the discussion of "By-Product Coke". Mr. Schwerin stated that the product of by-product coke depended on whether the ovens were operated primarily to manufacture coke or to produce by-products. The Reading-Bayonne Steel Casting Co. was proposed for membership at the business meeting of the association and the resignations of the Hewes & Phillips Iron Works, Newark, and the Alexander Traud Co., Newark, were received and accepted.

Problems of Capital and Labor

United States Commission on Industrial Relations Makes Report of Progress—Says Collective Bargaining is Generally Indorsed

The United States Commission on Industrial Relations on Dec. 7 submitted to Congress its first annual report covering the year ending Oct. 22, 1914. The report represents an outline of the research and investigation work now under way and a summary of the testimony of more than 500 witnesses, including employers, workmen, trade unionists, economists, public officials and others, who have appeared before the commission at public hearings in various cities from New York to San Francisco.

No conclusions are stated by the commission and the report is intended to be merely a record of progress. Under the act creating the commission, the final report, containing conclusions and recommendations, will be submitted to Congress before next August.

A summary is given of testimony taken at the public hearings. These were held in Washington, New York, Paterson, New Jersey, Philadelphia, Boston, Chicago, Lead, South Dakota, Butte, Montana, Seattle, Portland, Oregon, San Francisco and Los Angeles.

The commission says that its efforts were to ascertain the causes of industrial strife, to plan their removal and mitigation and suggest machinery that will facilitate in some degree the future orderly and peaceful conduct of industry on a level that will insure the maintenance of the highest practicable standards of working and living conditions. As to what has been accomplished up to date, the commission says:

"The hearings have served two other great purposes. First, they have carried to the general public for the first time, it is believed, an idea of the issues involved in the industrial struggle and an understanding of the causes which make for industrial unrest.

"Second, they have compelled both employers and labor to consider deeply their own weaknesses and shortcomings, and to search for means to correct evils which have been brought to their attention in this public manner."

Collective Bargaining

The report says that the general principle of collective bargaining involving the existence of unions and employers' associations in some form, was endorsed by almost every witness except members of the I. W. W.

"It is remarkable," says the report, "that there has been almost complete agreement upon the part of witnesses, employers and employes, who have appeared before the commission, favorable to the general principle of collective bargaining. There is widest divergence in regard to the form which the various witnesses believe that such collective bargaining should take, and in many cases it must be said that the correctness of the principle was admitted grudgingly. Nevertheless, only five witnesses from among the employers objected to the principle of collective bargaining.

"On the other side, the principle of collective bargaining is practically rejected by the various representatives of the Industrial Workers of the World, who maintain the theory that there can be no just bargaining between employers and employes. They admit, however, that in practice it is desirable to conduct negotiations with employers or employers' associations in order to secure the best possible terms for the workers, but hold that if agreements arise from such negotiations they need not be respected.

"It is interesting to note that a large number of employers, including some who do not employ union workmen, not only expressed themselves as being in complete accord with the principles of collective bargaining, but also expressed the opinion that a large part of the improvements in industrial conditions in the last half century have been due to collective bargaining with existing trade unions.

"Many of these have also claimed that the larger part of such improvement has come from the general improvement of economic conditions and from the initiative of employers and a more enlightened business policy.

"A majority of the best informed witnesses who have appeared before the commission have insisted, however, upon the necessity of securing a proper basis upon which such collective bargaining can be carried out. It is impossible to analyze these suggestions at this time, but it may be well to note that practically all of the most experienced witnesses have insisted upon the necessity for strong organizations of both employers and employes as a fundamental basis for the successful conduct of collective bargaining.

"Witnesses representing both of the parties to a number of the national trade agreements which are now in effect have appeared before the commission and without exception have testified that such agreements have not only greatly improved the conditions of the workers in the industry, but have tended to the promotion of stable industrial peace. Numerous alleged defects in these agreements have been pointed out, but none of the parties to these existing national agreements has failed to express the desirability from the standpoint both of employers and employes of such a method of determining the wages and other conditions which prevail in an industry.

Regarding mediation and arbitration,

What Employes Say

By employes and their representatives the following causes of unrest among others, were advanced at the hearings:

Normal and healthy desire for better living conditions.

Protest against low wages, long hours, insanitary and dangerous conditions existing in many industries.

Demand for industrial democracy, and revolt against the suppression of organization.

Unemployment.

Unjust distribution of the product of industry.

Unjust attitude of police and courts.

There is one law for the rich, another for the poor.

Immigration and the consequent over-supply of labor.

Disregard of grievances.

Unfair competition from prison and other exploited labor.

The rapid pace of modern industry.

Arbitrary discharge of employes.

Blacklisting of individual employes.

Exploitation of women and children in industry.

Promotion of violence by the use of gunmen, spies, and provokers hired by employers.

Attempt to destroy unionism by the pretense of the "open shop."

Monopolization of land and natural resources.

Suppression of free speech and right of peaceful assembly.

Problems of Capital and Labor

Additional Hearings Will Be Held and Investigations Continued

says the report, expert witnesses from both sides have unanimously endorsed the general proposition that mediation should be used to the greatest possible extent and as early as possible in the settlement of disputes, and that the machinery for prompt and impartial arbitration should be developed as a method of securing peaceful settlement where mediation and conciliation fail.

Favor Federal Board

"There was practically unanimous agreement among the witnesses that the formation of a federal commission of mediation and conciliation, composed of representative employers and employes, would be a desirable step toward the establishment of industrial peace and the protection of the nation from the damage resulting from protracted strikes and lockouts, with which the individual states seem incapable of dealing. It was impressed upon the commission, however, that the very greatest consideration and care should be given to the organization of such a commission and that, before all, the method of selecting its members should be such as to secure the representation of the interests involved and the exclusion of politics."

Additional Hearings

The commission presents its tentative program for future public hearings, as follows:

Centralization and Control of Industry. New York City.

Manufacturing Industries. Chicago; Indianapolis; Birmingham; Atlanta; Boston; Pittsburgh; Detroit.

Mining Industries. Chicago; Denver; Wheeling; Calumet.

Railroads and Other Public Utilities. Chicago. Including general railroad problems; strike on the Harriman lines, telegraphers; the Pullman Co.; and street railways.

Agriculture and Land Problems. Chicago; St. Louis or Kansas City; and Washington.

Unorganized Labor

Of unorganized labor, the report says:

"The commission realizes that all wage earners are not organized, that there are thousands of workers outside the union where individual bargaining prevails. The conditions in these unorganized employments are being carefully studied. In connection with these investigations, special attention is given to the reason for this lack of organization, in order to discover how far it is due to the general aversion to organization, how far to apathy and ignorance, and how far to fear of active opposition on the part of the employer. There can, however, be no question that one of the contributing causes of industrial unrest is the conviction of labor that lack of organization makes inevitable disastrous inequality between employers and employes."

Employers' Side

Causes of unrest by employers at the hearings of the commission are stated as follows:

Normal and healthy desire for better living conditions.

Misunderstanding and prejudice. Lack of conception that interests of both labor and capital are identical.

Agitation by politicians and irresponsible agitators.

Unemployment.

Unreasonable demands arising from strength of organization.

Labor leaders who stir up trouble to keep themselves in office and to graft on employers.

Inefficiency of workers, resulting in ever increasing cost of living.

Rapidly increasing complexity of industry.

Sudden transition of a large number of foreigners from repression to freedom, which makes them an easy prey to labor agitators.

Universal craze to get rich quick.

Decay of old ideas of honesty and thrift.

Misinformation in newspapers.

Too much organization for combative purposes instead of for cooperation.

Violence in labor troubles.

Sympathetic strikes and jurisdictional disputes.

Boycotting and picketing.

Meddlesome and burdensome legislation.

The closed shop, which makes for labor monopoly. Financial irresponsibility of labor unions.

Unemployment

Of unemployment, the report says: "Nothing comes so clear to the commission as the imperative necessity of organizing a market for labor on a modern business basis, so that there will be no vacant jobs and idle workers in the same community at the same time, or within distance where the transportation is practicable. The consensus of opinion is that legislation for a national system of labor exchanges is an immediate necessity. The plan of the commission proposes to establish a bureau of employment in the department of labor, which would co-operate with state and municipal employment offices, regulate private agencies doing interstate business, and establish clearing houses for distributing information, uniting all labor exchanges into one national system.

"The system of casual labor, by which men are hired for a few hours a day, a few days a week, is filled with menace, not only to industry, but to American institutions. From casual and infrequent labor it is but a step to practical vagrancy and general disintegration, and out of these despairs and revolts, serious dangers threaten organized society."

No Conference

Chicago, Dec. 7.—The Stove Founders' National Defense Association and the National Molders' union have agreed to omit the annual conference over wage matters usually held at this time of the year. The effect of this will be to continue the present scale of wages as agreed upon at the preceding conference for another year.

Conditions of business and slack labor led to the omission of the conference at this time.

Arbitrators in Session

Chicago, Dec. 7.—Extended hearings before a board of arbitration chosen to settle difficulties between 98 western railroads and their engine employes have been in progress in this city for the past 10 days. It is believed it will require at least three months to take the evidence which has been prepared for consideration.

The original requests of the enginemen were presented Oct. 10, 1913, and an estimate indicated the increase of wages would be approximately $27,000,000 per year. Various propositions and proposals were made by the railroads and enginemen during the present year.

Morgan Park

Is Name of New Steel Plant Town—Status of Duluth Works

Duluth, Dec. 8.—Although construction work on the new plant of the Minnesota Steel Co. has been almost at a standstill for six months, a small force of men has been retained and some building progress made. It is not probable, however, the plant will make any steel in 1915. The blast furnace equipment practically is ready for operating; the coke oven plant is 75 per cent complete and a large proportion of the open-hearth furnace work is done. The soaking pits partially are finished. Considerable mill equipment is in place and quantities of machinery are on the ground ready for installation. A good deal of equipment remains yet to be ordered, including such items as ingot cars, molds, stools, ladles, etc. The plant probably could be started next year, if the Steel Corporation officials decide that business and financial prospects would warrant pushing the work to completion.

Substantial progress has been made in building the town which will contain the homes of the employes. This town, which is located alongside the works, has been named Morgan Park, in honor of the late J. P. Morgan. It is laid out carefully and to date 170 houses containing 350 apartments have been built. The houses are of hollow concrete block construction and are modern in all respects. A special effort has been made to vary the appearance of the houses, so as to avoid the deadly monotony that characterizes the exteriors of some mill towns.

Where the houses contain two or more apartments, individual basements and heating apparatus have been provided. The streets are paved with concrete and are provided with wide parking strips.

Morgan Park will contain the Minnesota Steel Co.'s offices, check house, hospital, etc. A combination grade and high school building, specially arranged for vocational training and modeled on the schools of Gary, Ind., will be constructed, together with stores and other conveniences.

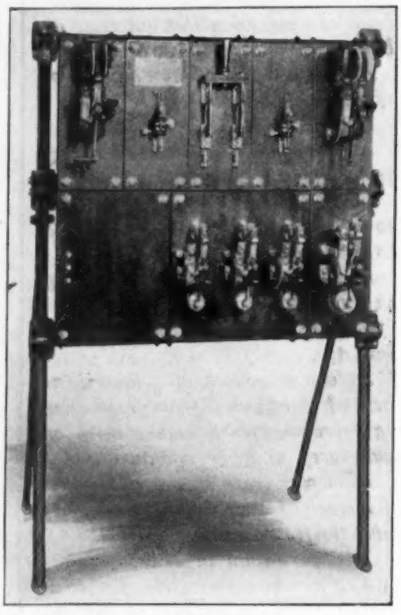
Cuyuna Range Mine News

Brainard, Minn., Dec. 8.—Shipping has ceased on the Cuyuna range. The underground mines stockpiling are the Armour No. 2 at Crosby and the Kennedy at Cuyuna, both belonging to the Rogers, Brown Ore Co. The Armour No. 2 is hoisting about 20,000 tons a month and the Kennedy about 16,000 tons a month.

The Adams, underground mine at Oreland, has closed down for the winter. The Cuyuna-Mille Lacs and the Cuyuna-Duluth mines of the American Manganese Mfg. Co. have closed down temporarily, the pumps continuing to work. Some changes in pumpage will be made, an electric pump being installed at the Cuyuna-Mille Lacs.

Shaft sinking is in progress at the Croft mine at Crosby, down 68 feet; the Brainerd-Cuyuna mine in Brainerd, down over 60 feet; the Cuyuna-Sultana Iron Co. sinking its second shaft; the Wilcox mine at Woodrow, engaged in drifting.

The Pennington pit mine has closed down for the winter. The Rowe pit mine has a shovel stripping and it is said a $1,000,000 concentrator plant is contemplated if the Little Rabbit lake can be dammed for the purpose. The Inland Steel Co. Thompson pit mine in Crosby is stripping. Stripping will commence in spring at the property of the Cuyuna Iron & Manganese Ore Co.



NEW MAGNETIC SWITCH

At the Crow Wing county poor farm a drill of the Longyear Exploration Co. is on the eighth hole. Ore had previously been located in five out of seven holes. A slow market for ore is curtailing production on the Cuyuna range.

Magnetic Switches

A new line of magnetic switches recently has been developed by the Cutler-Hammer Mfg. Co., Milwaukee. This includes a magnetic lock-out switch of the series coil operated type, as shown in the accompanying illustration, and a redesigned line of shunt coil operated switches. Both are of the clapper type construction.

The new magnetic lock-out switch is for automatic motor starting purposes and has a number of features claimed to be of particular advantage. In earlier types there was a section of restricted area in the magnetic circuits giving comparatively small sealing pull and contact pressures. As the new switch has no such restricted area, the sealing pull is equal to that of shunt coil operated switches of the same capacity, permitting higher contact pressures and greater "follow-up" on contacts to allow for wear. Tests made to determine the relative contact pressures of these switches and the single coil series switches of the restricted area type showed an increase of 60 per cent in the new type.

The Cutler-Hammer magnetic lock-out switch remains open when the current exceeds a pre-determined and adjustable value, and closes when the current falls below this value. An interesting feature of the new switch is that the same contacts, "follow-up" and auxiliary contacts that are employed on shunt coil operated magnetic switches are used. On the 100 ampere switches, the arcing contacts are also the current carrying contacts. For the larger size switches, laminated brush contacts carry the current, auxiliary arcing contacts being provided.

The series-wound operating coil of the magnetic lock-out switch is divided into two parts. The upper section is bar wound, and the lower consists of copper and asbestos ribbon. The upper part of the coil tends to close the switch and the other section to hold it open. This switch is made up as a single unit, and numbers can be assembled according to the number of steps of resistance used in the motor circuit in starting. In the illustration is shown four accelerating switches on a 75-horsepower, 230-volt panel.

Cutler-Hammer direct current magnetic switches previously furnished have been of the clapper type in the smaller sizes, and of the contactor type in the larger sizes. The shunt switches have been redesigned, all now being of the clapper type. The advantage of this type of switch is in its greater arc-rupturing capacity, longer life of the contacts, more rapid operation, easier access to parts subject to inspection and repair, and the possibility of interchanging parts with the magnetic lock-out type switches. The new line of magnetic switches is made in 11 sizes and types ranging in capacities from 50 to 3,600 amperes.

Ore Shipments

From Lake Superior Ranges for the Past Season

Lake Superior iron ore shipments for the season of 1914 now are complete and show that 32,021,897 tons were moved during the season. Only one cargo was moved during December, involving 1,411 tons, from Escanaba. The movement is 17,048,581 tons below that of 1913, when 49,070,478 tons were moved. The movement is practically one-third less than that of 1913, and as furnace orders are now beginning to come in, it is reasonable to expect the ore trade of the lakes will open early next spring. The shipments by ports during the season, with corresponding data for 1913, were as follows:

Port.	Nov., 1914.	Nov., 1913.
Escanaba	223,459*	485,102
Marquette	104,147	194,720
Ashland	133,673	281,476
Superior	389,279	929,368
Duluth	121,248	810,973
Two Harbors	98,286	569,319
	1,070,092	3,270,958
1914 decrease	2,200,866	.....

Port.	Season, 1914.	Season, 1913.
Escanaba	3,664,451	5,399,444
Marquette	1,755,726	3,137,617
Ashland	3,363,419	4,338,230
Superior	11,309,748	13,788,343
Duluth	6,318,291	12,331,126
Two Harbors	5,610,262	10,075,718
	32,021,897	49,070,478
1914 decrease	.....	17,048,581

*Includes 1,411 tons shipped in December.

Following are the shipments for the past ten years:

Season.	Gross tons.
1905	33,476,904
1906	37,513,595
1907	41,288,755
1908	25,427,094
1909	41,683,873
1910	42,620,201
1911	32,130,411
1912	47,435,777
1913	49,070,478
1914	32,021,897

There are still a few vessels out on the lakes though the grain shippers are through with chartering. The closing rates on grain were very unsatisfactory and a leading interest did not accept them. There are a few more coal cargoes to be shipped this week and then the season will be definitely over.

Name Receivers.—Receivers have been named in the United States district court at New York City for the United States Metal Products Co., of 111 Broadway, New York City, upon the application of the company itself. The liabilities are estimated at $1,008,550 and the assets at about $3,000,000. The receivers named are Albion B. Turner, president of the company, P. T. Sherman and Thomas C. Clarke. The company is a manufacturer of metal doors, window frames and interior fireproofing for buildings and has operated a plant at College Point, L. I. The company was incorporated in January, 1911, with a capital of $8,000,000, and absorbed the John W. Rapp Co. and the J. F. Blanchard Co. The receivers were authorized in their discretion to continue the business 90 days.

High Record for Zinc Exports

All previous records in exportations of domestic zinc were surpassed by the shipments during the last three months which rose to the unprecedented total of 65,504,574 pounds, valued at $4,443,381, as compared with 1,346,877 pounds, valued at $80,756, in the corresponding period a year ago.

Figures compiled by the Bureau of Foreign and Domestic Commerce of the Department of Commerce show that the exports of domestic zinc in the form of pigs, ingots, bars, etc., in the last three months exceeded the total for the seven-year period which ended with June, 1914. In the last four fiscal years, zinc exports have averaged 12,800,000 pounds per annum. In 1897, the former high-record year in exports of zinc, the total was 35,869,987 pounds. That figure, however, was surpassed by the single month of September last, with an export total of 38,090,144 pounds of zinc pigs, ingots, etc.

The unusually large exports of zinc in recent months were sent chiefly to Europe. In September, when the exports of zinc pigs, etc., rose to the highest point ever known, 28,000,000 pounds were sent to England, 3,000,000 pounds each to Scotland and France, and 333,333 pounds each to Denmark and Italy, while 1,250,000 pounds went to British Africa, and 250,000 pounds to Australia.

Give Up Dinner

Duluth, Dec. 8.—Employes of the Minnesota Steel Co. have decided to forego the annual dinner usually provided at this season and to donate a sum equal to its usual cost to the relief of Belgian war victims.

The Latrobe Electric Steel Co., Latrobe, Pa., expects to renew operations at an early date. The company has received an order for projectiles, it is reported.

Addressed Chemical Engineers

Philadelphia, Dec. 8.—George Otis Smith, director of the United States Geological Survey, in addressing the American Institute of Chemical Engineers at their seventh annual convention in this city, on "Industrial Opportunities" said that for the United States to increase its industrial prosperity, it was necessary for it to export finished rather than crude products and to import raw materials, rather than manufactures.

Papers discussing various subjects pertaining to chemical engineering, were presented at the meeting.

In the election of officers, Dr. George D. Rosengarten, of the Powers-Weightman-Rosengarten Co., Philadelphia, was made president; J. M. Stillman, Hoboken, vice president; J. C. Olsen, of New York, secretary; F. W. Frerichs, St. Louis, treasurer; George P. Adamson of Easton; J. B. Herreshoff of New York and S. P. Sadtler of Philadelphia, directors.

Sinners Sinned Against

"A New Conception of Service in Advertising," is the title of an exceedingly attractive pamphlet which has just been issued by the Shuman Advertising Co., 110 South Dearborn street, Chicago. Every page is interesting even to a person who has nothing to do with the placing of advertising and to the man who has something to say about how a company's money should be spent in advertising, many helpful suggestions are made. The pamphlet says that trade journals have sinned, but that they have been sinned against 10 times as much as they have themselves offended. The little pamphlet shows what thought and investigation applied to advertising can accomplish.

Busy Company

Flint, Mich., Dec. 8.—The Buick Motor Car Co. is 10,000 cars ahead of its orders of a year ago and it is confidently expected that the corporation will produce and market 40,000 cars this season—the mark set for it at the beginning of the year. The company's foreign business has been held practically intact.

The West End Trust Co., of Philadelphia, trustee, will hold a sale at noon, Dec. 16, to dispose of the property of the Vulcan Iron & Steel Co. This consists of shafting, machinery, engines, boilers, pumps, tools, fixtures, dynamos and other material.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

THE machinery market in the east has been devoid of important developments during the week. Interest continues to center around the shrapnel requirements of the belligerents in Europe and representatives of all kinds of manufacturing plants continue to come to New York to investigate the prospect of getting shrapnel contracts. It appears, however, that no further business of this nature has been awarded. While a number of concerns continue to figure on this business, others have decided not to engage in the manufacture of this class of munitions of war. The Bethlehem Steel Co. has not yet closed on the second shrapnel contract which it had under consideration and as a result its additional requirements, involving between $200,000 and $300,000, have not yet been placed. The Electro Dynamic Co., Bayonne, N. J., which booked a large contract for motors from the Bethlehem Steel Co., it is understood, has not yet closed on all its requirements. One of the eastern railroads is in the market for a considerable amount of machinery which is expected to be closed next week. Some good inquiries for lathes and drilling machines are reported as having been received from Russia and France. There have been considerable exports of machine tools during the week whose ultimate destination is Germany. A considerable business in second hand machine tools is reported by some New York dealers.

At Pittsburgh, machine tool builders continue to receive scattering inquiries for equipment, but the volume of business is comparatively light. The Ligonier Valley railroad has awarded a contract for the erection of machine shops at Ligonier, Pa., and is expected to send out a list for tools at an early date. Ground for a small machine shop at Washington, Pa., has been broken, and it is reported that additional equipment will be installed in an extension to the plant of the Greenville Steel Car Co., Greenville, Pa. Work has commenced on the new plant of the Alloy Steel Forging Co., at Carnegie, where some new equipment will be needed. Rolling mill machinery makers advise that there has been no change in the situation.

Owing to peculiar conditions existing in Chicago as to the machine tool trade the bettered situation existing for the most part through the country has not been felt here. Large orders for export have been placed mostly with manufacturers, who are unusually busy, but as there are comparatively few manufacturers of tools in this city the increase of business has not been felt except slightly by indirection. Indications are present that added business will be obtainable after the first of the year, as railroads are now considering their requirements for next year, but will give no idea as to what they may buy. Occasional sales are being made of single tools, but no marked improvement can be detected from any direction.

In Cincinnati, the month of November has been the best in the machine tool trade during the year. Almost all of the orders received have come from European countries engaged in the war, and have been chiefly for lathes, but enough contracts for milling machines, radial drills, and shapers have been closed to keep plants manufacturing these machines busy on full time until after the first of the year. Makers of lathes, such as the Lodge & Shipley Machine Tool Co., the American Tool Works Co., the Greaves-Klusman Co., and the R. K. LeBlond Machine Tool Co., are operating night shifts in several departments, as specifications in most cases call for immediate delivery. The Cincinnati Milling Machine Co. is running full force day and night, and the Cincinnati Bickford Tool Co. has recently received a sufficient number of orders to keep it busy in all departments for some time. Stock tools have been exhausted for a month or more, and taken as a whole, the war has been a boon to certain branches of the machine tool industry. Demand from this country remains at a low ebb.

EASTERN STATES

BATH, ME.—Kelly, Spear Co. has the contract for two coal barges for the Staples Transportation Co., Fall River, Mass., one having a carrying capacity of 3,500 tons and the other of 2,500 tons.

PORTSMOUTH, N. H.—Machine shop connected with the Boston & Maine roundhouse was badly damaged by fire.

BURLINGTON, VT.—City council has passed a resolution to bond the city for $50,000 to enlarge and improve the municipal electric light plant.

BOSTON.—Jones Bertsch Co., brass worker, was badly damaged by fire, loss about $45,000.

BOSTON.—Costmeter Co. has been incorporated to manufacture machines; $900,000 capital stock; by A. W. Murray, Cambridge, Mass.; J. A. Galvin, Hyde Park, Mass.; L. C. Goodhue, Andover, Mass.

BOSTON.—American Sugar Refining Co. has been granted permit to erect engine house at its plant in South Boston.

FALL RIVER, MASS.—City will erect a one-story and basement, 45 x 65-foot pumping station.

WORCESTER, MASS.—Persons-Arter Machine Co. has been incorporated; $60,000 capital stock; by Charles A. Persons, Peter J. Nihill, et al.

ANSONIA, CONN.—Ansonia Foundry Co. has been incorporated; $5,000 capital stock; by William Olderman, Michael Michaelson, et al.

BRIDGEPORT, CONN.—Bridgeport Brass Co. has let contracts for a four-story building at East Main street and Crescent avenue, to the Aberthau Construction Co., Boston; plans have been designed by the Fletcher Engineering Co.

EAST HARTFORD, CONN.—A. C. Kenaeson and his sons are planning the erection of a ladder factory.

FORESTVILLE, CONN.—Wallace Barnes Co., spring manufacturer, Bristol, Conn., has started preliminary work for a factory in Forestville.

WATERBURY, CONN.—Scoville Mfg. Co. will build a one-story, 167 x 211 and 16 x 558-foot warehouse.

WINCHESTER, CONN. — Westinghouse, Church Kerr Co., New York and Boston, will

Flooring!

My! but doesn't that one little word convey all kinds of TROUBLE EXPERIENCES to you?

It brings to your recollection the hundreds of costly delays, the multitude of repair expenses, the numerous accidents—all due to faulty flooring.

"Flooring"—it has proved an almost never ending nightmare to MANY unfortunate plant managers; UNFORTUNATE we say, because for some reason or other these plant managers have failed to keep abreast of the times—failed to realize that there IS a remedy for flooring troubles—effective, permanent!

Our little booklet "FLOORS" will prove to you that AYER & LORD INTERIOR WOOD BLOCKS are wearproof, dustless, sanitary and silent.

Write Us Today for a Copy

Ayer & Lord Tie Company

General Office, Railway Exchange, Chicago

CLEVELAND, O.—801 Swetland Bldg.
KANSAS CITY, MO.—1117 Rialto Bldg.
MEMPHIS, TENN.—1402 Exchange Bldg.
PHILADELPHIA, PA.—319 Perry Bldg.

AYER & LORD INTERIOR Always Easy on the Feet WOOD BLOCKS

The illustration above shows Ayer & Lord Interior Wood Blocks installed in a large engine factory.
Altho the trucking of heavy motors about this shop is very severe, the flooring is not affected in the least.

AYER & LORD INTERIOR Always Easy on the Feet WOOD BLOCKS

erect several large buildings in Winchester.

BUFFALO.—Buffalo Automobile Spring Co. has increased its capital from $10,000 to $25,000.

ELMIRA, N. Y.—Thatcher Mfg. Co., maker of glass bottles, is erecting four new buildings.

GENEVA, N. J.—Geneva Glass Works was burned with about $75,000 loss.

JAMESTOWN, N. Y.—Crescent Tool Co. is building a three-story and basement, 50 x 186-foot addition.

LONG ISLAND CITY, N. Y.—National Sugar Refining Co. has awarded the contract for a two-story addition to its plant at Front and Pigeon streets.

NEWBURG, N. Y.—City is considering the erection of a $200,000 municipal light plant.

NEW YORK.—Sunshine-Jasper Co., ironing machinery, has been incorporated; $5,000 capital stock; by T. G. Jasper, Isreal Engel, Monroe Sunshine, 622 West 135th street.

NEW YORK.—Greenwick Machine & Tool Co., has been incorporated; $10,000 capital stock; by W. E. Blackledge, W. E. Rankin, F. H. Peterman, 27 Sutton Place.

NEW YORK.—Industrial Iron Co. has been incorporated; $100,000 capital stock; by H. T. Kehr, J. C. and E. T. Sample, 74 Elm street, Queens.

NEW YORK.—Gibralter Alarm Lock Co. has been incorporated; $35,000 capital stock; by L. Hellman, Bruno Pfeiffer, H. Eisenberg, 78 East Ninty-sixth street.

NEW YORK.—Alco Pearl Works, buttons, etc., has been incorporated; $10,000 capital stock; by Florence Donnelly, Henry Probst, Jacques Cohen, 232 East Sixty-ninth street.

NEW YORK.—Tubrim Mfg. Co., garbage cans, electric cutouts, hardware, motors, has been incorporated; $50,000 capital stock; by L. Feine, D. Greenbaum, L. B. Brodsky, 1442 Forty-sixth street, Brooklyn.

NEW YORK.—Wilson Equipment Co., instruments, machines, tools, has been incorporated; $10,000 capital stock; by T. B. Hoy, C. J. Schmid, F. B. Wilson, 230 Boulevard, Passaic, N. J.

NEW YORK.—Brutt Lithographing Co., West 129th street, bought a site in Long Island City for a $145,000, four-story brick factory and garage to be ready for occupancy next June.

NEW YORK.—Van Vechten Machine Co., builders, mill supplies, engineering, has been incorporated; $10,000 capital stock; by Edward J. Coughlan, George Sattler, William Martin, 22 Thames street.

NEW YORK.—W. R. Kerschner Co., machinery railway supplies, has been incorporated; $50,000 capital stock; by W. R. Foster, B. E. Hawk, W. R. Kerschner, 252 West Niney-first street.

NEW YORK.—Standard Safety Nut Co., manufacturer of nuts, railroad supplies, etc., has been incorporated; $125,000 capital stock; by Paul W. Diets, George H. Whittlesey, I. Vernon Weisbrod; Dexter, Osborn & Fleming, attorneys, 71 Broadway.

NIAGARA FALLS, N. Y.—A. M. Boff & Son are altering their plant.

QUEEN, N. Y.—P. J. Mara, Inc., pile driver, bridge, dock construction, has been incorporated; $5,000 capital stock; by J. P. Murray, P. J. and K. H. Mara, Whitestone avenue, Flushing, N. Y.

ROCHESTER, N. Y.—Wm. Baker, Birr street and Raines Park, is erecting a 33 x 85-foot machine shop at 621 Oak street.

SILVER CREEK, N. Y.—Silver Creek Case Goods Co., general manufacturer, has been incorporated; $75,000 capital stock; by G. Humphrey, F. and P. Kofold.

WATERTOWN, N. Y.—New York Utilities Co. has increased its capital from $1,000,000 to $2,000,000.

ALLENTOWN, PA.—F. L. Dillon Construction Co. will erect a $40,000, one-story, 94 x 350-foot, brick and steel, silk mill at East South and Carlisle streets, for Kaltenbach & Stephens.

BROCKWAYVILLE, PA.—Brockway Telephone Co. has been incorporated; $10,000 capital stock; by R. L. Warren, G. M. Bradel, J. W. Johnson, B. E. Taylor, et al.

BRYN MAWR, PA.—J. Howard Supplee is having plans prepared for a two-story 60 x 188-foot brick factory.

ERIE, PA.—G. Daniel Baldwin, contractor, will erect a $40,000 three-story business block; steel beams and reinforced concrete will be used largely in the building.

ERIE, PA.—Agreement with the railroad companies for the elimination of five grade crossings by constructing subways has been reported by Mayor W. J. Stern; estimate of the city's share is about $240,000.

ERIE, PA.—Unconfirmed reports are that John K. Dillon, Titusville, Pa., principal owner of the Titusville Forge Co. and Erie capitalists have purchased a 60 x 165-foot lot at Tenth and State streets and will erect a 10 or 12-story steel building in the spring.

GREENVILLE, PA.—Greenville Steel Car Co. is erecting a 90 x 440 foot addition to its plant; F. L. Fay is general manager of the company.

HOMER CITY, PA.—Homer Light, Heat & Power Co., has been incorporated with offices at Clearfield, Pa.; $5,000 capital stock; by W. O. Hoover, James P. O'Laughlin, Warren Partridge, Clearfield, Pa.

LANCASTER, PA.—Hub Shock Absorber Co. has increased its capital from $50,000 to $300,000.

LIGONIER, PA.—Ligonier Valley railroad has awarded a contract to the McClintic-Marshall Co., Pittsburgh, for the erection of a machine shop at this city, in which considerable equipment will be installed; the building will involve about 225 tons.

MERCER, PA.—Work on the Mercer Planished Steel & Iron Co.'s plant at this city is progressing rapidly; some of the new equipment has been installed.

NEWCASTLE, PA.—G. W. Ensign, Inc., has been awarded the contract for a steel and concrete bridge to span the Shenango river, for $43,247.

PHILADELPHIA.—Walker & Davis, inc., machinery, has been incorporated; $10,000 capital stock; by Eugene H. Davis, et al.

PHILADELPHIA.—Kent Mfg. Co., 4937 Stenton avenue, has let contract for one-story, 120 x 120 foot building.

PHILADELPHIA.—Harrison Bros. & Co., Inc., are building a two-story addition, 30 x 90 feet, at Thirty-fifth street and Gray's Ferry road.

PHILADELPHIA. — Peuckert & Wunder have completed plans for two-story machine house, 36 x 60 feet, to be erected for Jacob Hornung on Twenty-second street, near Clearfield.

PITTSBURGH.—Copper Die Horseshoe Co. has increased its capital from $10,000 to $37,200.

PITTSBURGH. — Walker & Curley, contractors, are awarding sub-contracts for an addition to the court house at Smithport, Pa.

PITTSBURGH.—Superior Oxygen Co., 2515 Liberty avenue, plans to open plants in 10 cities throughout the country. E. H. Muller is general manager of the company.

PITTSBURGH. — The United States engineers office will receive bids until noon Dec. 17 for furnishing and delivering river-wall jackets, lock gate engines and gate operating gearing.

PITTSBURGH. — Dunlevy & Bros. have awarded the Walker & Curley Co. a contract for the erection of a $30,000 addition to its three-story packing plant; J. I. Davis & Co., architects, Chicago, are in charge.

PITTSBURGH. — Allegheny county commissioners have awarded the contract for bridge No. 19, which will span Pine creek near Mt. Royal, Shaler township, to the Fort Pitt Construction Co., Pittsburgh; the bridge will cost $18,000.

RAILROAD, PA.—Trunk factory to operate under the supervision of the Fibre Fabrics Co., Philadelphia, will be established at this place shortly.

WASHINGTON, PA.—W. L. Pettit will erect and equip a machine shop.

ADALPHIA, N. J.—William G. Southard will build a machine house in Adelphia.

CAMDEN, N. J.—Victor Talking Machine Co. will erect a one-story, 110 x 200-foot, brick and a concrete power house; bids will be taken shortly; Ballinger & Perrot, architects.

HADDON HEIGHTS, N. J.—Center Township Water Co. has been incorporated; $30,000 capital stock; by George A. Aldrich and George R. Aldrich, Audubon, N. J.; C. L. Paterson, Riverton, N. J.

HIGHLAND, N. J.—Highland Park Water Co. has been incorporated; $50,000 capital stock; by John M. Kelley, Hadden Heights, N. J.; Patrick A. Stewart, Charles A. Cogan, John Smith, Gloucester City, N. J.

JERSEY CITY, N. J.—Albert J. Higson Mfg. Co., mechanical devices, novelties, has been incorporated; $25,000 capital stock; by A. J. Higson, Jersey City; M. Friedberg, New York.

NEWARK, N. J.—Maas & Walderein Co., manufacturer of chemicals, soon will erect a $50,000 plant in Avenue R, near the Passaic river.

NEWARK, N. J.—National Realty & Construction Co. has been incorporated; $100,000 capital stock; Ephrain Samuel, Bessie and Paul Wolf.

DOVER, DEL.—Metal Molds Compressed Casting Co., New York, has been incorporated in Delaware to design, construct, buy, or otherwise acquire, use and operate, and dispose of molds constituted partly or wholly of iron, steel or other materials for the purpose of casting metals of all kinds, singly or in connection with other metals or substances, and the making of any or all articles from metal, steel, brass, etc.; $12,500,000 capital stock; by Alexander Holtzoff, John E. Bruckman, both of Brooklyn; W. I. M. Loftland, Dover.

WILMINGTON, DEL.—Hanover Bessemer Iron & Copper Co. has been incorporated; $500,000 capital stock; by Charles B. Bishop, Clarence J. Jacobs, Harry W. Davis, all of Wilmington.

BALTIMORE.—Western Maryland Railway Co. will erect a grain elevator at Port Covington, estimated to cost more than $600,000.

WASHINGTON, D. C.—Department of commerce will receive bids until 2 p. m. Dec. 15 for constructing one annealing and heat-treating furnace, one crucible melting furnace and one oil installation to operate furnaces.

CENTRAL STATES

AKRON, O.—Blair Sheet Metal Co. was damaged by fire.

AKRON, O.—B. F. Goodrich Co. is about to begin work on an additional factory, to cost about $5,000.

AKRON, O.—Alloy Foundry Co. has been incorporated; $1,000 capital stock; by S. C. Gresham, E. F. Kibler, W. A. Lang, L. H. Wade, J. L. Snyder.
buildings will be constructed of brick, steel and tile.

BUCYRUS, O.—Bucyrus Steam Shovel & Dredge Co. is to be converted into an automobile tire factory at once.

BUCYRUS, O.—Bucyrus Implement Co. has awarded the contract to J. F. Wurm, New

Washington, O., for the erection of a 50 x 150-foot, brick shop and storehouse.

BUCYRUS, O.—Standard Engine & Sales Co., general manufacturer, has been incorporated; $1,000 capital stock; by C. P. Mader, John Martinitz, B. L. Hyland, F. A. Wise, D. G. Heiser.

CANTON, O.—Everhard Mfg. Co., electrical appliances, has been incorporated; $10,000 capital stock; by C. H. Everhard, H. H. Everhard, E. P. Everhard, Edith Everhard, Linda Everhard.

CHARDON, O. — Council has granted C. H. Felton, Cleveland, the right to construct, operate and maintain a waterworks system in Chardon; system to be completed by Jan. 1, 1916.

CINCINNATI. — Gasoline explosion did about $1,500 damage at the Ahrens - Fox Fire Engine Works, at Alfred and Cook streets.

CLEVELAND.—Entz Starter Co. has been incorporated; $10,000 capital stock; by J. T. Scott, D. L. Johnson, M. C. Byrnes, B. E. Robertson, M. G. McAleenan.

CLEVELAND.—James C. Wallace and others have purchased property and plan to erect a theater and business block to cost more than $100,000.

CLEVELAND.—Commissioner of purchases and supplies will receive bids until noon, Dec. 17 for three low lift steam turbine reduction gear driven centrifugal pumps for division pumping station.

CLEVELAND.—Plans for the proposed $2,000,000, 12-story freight terminal at West Ninth street and Main avenue were approved by the officials of the Big Four and Lake Shore railroads and the Home Financing Co.; work will begin in the spring.

CLEVELAND.—Plans have been completed by the engineers of the Lake Shore & Michigan Southern railroad for a $200,000 roundhouse and repair shop at Coalburg, O.; work will begin immediately after the first of the year.

COLUMBUS, O.—Ford, Die, Tool & Machine Co. has been incorporated; $10,000 capital stock; by S. S. Ford, G. F. Leatty, L. L. Ford, I. Yassenoff, J. A. Weidler.

COSHOCTON, O.—McClurg Rubber Co., capitalized at $250,000 will have a plant ready by April 1, according to J. S. McClurg, one of the incorporators.

FREMONT, O.—Plans for the Tindall bridge over the Sandusky river soon will be submitted for bids.

HAMILTON, O. — County commissioners have passed a resolution, providing for a $175,000 bond issue for the construction of the Woodsdale bridge, the Columbia and other county bridges.

HAMILTON, O.—Sinking fund commission will advertise for bids for $200,000 bonds to be for the erection of a city hall.

MARTINS FERRY.—City is contemplating the erection of a $70,000 municipal building.

NEWARK, O. — Shepard Machine Works will erect a 40 x 80-foot addition for the building of gasoline engines.

SANDUSKY, O.—William H. Hendrickson, who recently purchased the Suspension Roller-Bearing plant, will erect an addition for the manufacture of street cleaners.

SANDUSKY, O.—Sandusky Mfg. Co. has been incorporated; $25,000 capital stock; by William Hendrickson, George Fieck, W. H. Harsh, E. C. Harsh, Jay Daniels.

SANDUSKY, O.—J. J. Dauch, president of the Hind & Dauch Co., announces work on its proposed plant will be started early in the spring; Albert M. Allen, Cleveland, has plans.

STEUBENVILLE, O.—Straton Sewer Pipe Co., Empire, O., near here, plans to build a sewer pipe plant near Port Homer, Jefferson county, O.; new power house equipment and water supply apparatus will be installed.

TOLEDO, O.—National Electric Co. has increased its capital from $50,000 to $75,000.

TOLEDO, O.—States Motor Co. has been incorporated; $600,000 capital stock; by E. M. Cook, H. S. Bassett, S. H. Reff, H. M. Barfield, W. B. Smith.

TOLEDO, O.—Devilbiss Mfg. Co. has increased its capital $150,000 for the erection of a plant at Collinwood avenue and the city boulevard; plans contemplate a steel and fireproof building.

TOLEDO, O.—Toledo Metal Mfg. Co., recently incorporated at $60,000, proposed to develop the plant at Cleveland and Michingan streets, operated as the Toledo Tank & Boiler Co.; it is proposed to enlarge the present building; Joseph F. Drosswiller, president.

WEST TOLEDO, O.—Central Machine & Tool Co., manufacturer, has been incorporated; $20,000 capital stock; by Leonard Banreth, George Mannes, John Huefner, Michael Mertes.

WOOSTER, O.—Wooster Shale Brick Co. is planning to increase its capital from $150,000 to $250,000, W. R. Barngard, president, states the present capacity of the plant will be doubled.

ZANESVILLE, O.—R. C. Burton has purchased the Lane brick yard and plant and proposes to begin work at once to remodel and triple the present capacity; remodeling will cost $50,000.

CLARKSBURG, W. VA.—Clarksburg Glass Co. has awarded a contract to the Moss Iron Works, Wheeling, for the erection of a new plant at this center.

FAIRMONT, W. VA.—Marion Brick Co. plans to erect a plant to cost about $50,000.

FAIRMOUNT, W. VA.—West Fork Railroad Co. has been incorporated to construct a railroad from Fairmount to Grafton; $10,000 capital stock; by Scott C. Lowe, M. A. Flesher, J. A. Jamison, C. L. Shaver R. S. Reed, Fairmount.

MORGANTOWN, W. VA. — Sub-contracts on the proposed $150,000 high school are being placed by R. R. Kitchen & Co., general contractors, Wheeling.

WHEELING, W. VA.—It is reliably reported that John Ping & Co., toy manufacturers, Westphalia, Germany, will erect a plant at this city.

CARLISLE, KY.—Carlisle Electric Light & Power Co. has been awarded a new franchise and will make extensive improvements in its plant.

FULTON, KY.—The municipality plans improvements in the water works system, according to reports made by fire underwriters.

LAWRENCEBURG, KY.—Kentucky River Stone & Sand Co. will enlarge the capacity of its stone-crushing plant; the machinery is motor-driven.

LAWRENCEBURG, KY.—The mayor has information relative to improvements in the water system, which will be financed by a recent bond issue.

LOUISVILLE, KY.—New York Laundry will be in the market for motors for its plant in the near future.

LOUISVILLE, KY.—Monarch Auto Co., 206 East Broadway, will install additional apparatus, including an electrical-charging apparatus, its capitalization recently has been doubled.

MARION, KY.—Dr. Robert L. Moore is at the head of a company which will install a water plant; a franchise is to be offered by the town shortly.

OWENSBORO, KY.—Light and water department is taking bids on a 250-horsepower boiler.

VINE GROVE, KY.—Citizens Lighting Co. has increased its capital and will make improvements; W. E. Crutcher is owner of the plant.

EAST CHICAGO, IND.—Baltimore & Ohio car repair shops and roundhouses were badly damaged by fire.

EVANSVILLE, IND.—Evansville Brewing association has begun the construction and equipment of an ice factory to cost $25,000.

INDIANAPOLIS. — Premier Construction Co. has been incorporated; $20,000 capital stock; by Leon J. Cooper, Homer O. Cooper, Carl E. Wood.

JEFFERSONVILLE, IND.—An appropriation of $16,000 for the installation of two

Santa Claus and Business

"Shop early," is the keynote these days to business that has to do with the Christmas spirit.

The same principle applies to ALL business.

One advantage readers of this column have is their list is made up already; all that remains is to ACT.

Therefore if you would benefit by the following suggestions, act NOW—

SHOP EARLY!

Ligonier Valley Railroad has awarded a contract to the McClintic-Marshall Co., Pittsburgh, for the erection of a machine shop at Ligonier, Pa., in which considerable equipment will be installed. The building will envolve about 225 tons.

Superior Oxygen Co., 2515 Liberty avenue, Pittsburgh, plans to open plants in ten cities throughout the country. E. H. Muller is general manager of the company.

Plans for the proposed $2,000,000, 12-story freight terminal at Cleveland, were approved by the officials of the Big Four and Lake Shore Railroads and the Home Financing Co.; work to begin in the spring. Plans call for 9,000,000 cubic feet of storage room, including 1,000,000 feet of refrigeration. The terminal is to have eleven automatic conveyors for loading and unloading shipments and eleven elevators.

Plans have been completed by the engineers of the Lake Shore & Michigan Southern railroad for a $200,000 roundhouse and repair shop at Coalburg, O. Work will begin shortly after the first of the year.

Ford, Bauck & Davis, 921 Canal street, New Orleans, have plans for the board of trade of the port of New Orleans for a cotton compress, sorting sheds, power house, and warehouse to cost $1,000,000. Buildings will be of reinforced concrete and cover 727,000 square feet.

boilers in the Indiana reformatory has been asked by Supt. D. C. Peyton.

KNOX, IND.—A large toy pistol factory will be established in Knox, states I. W. Allen and H. Goodes, St. Joseph, Mich., who have purchased the plant of the Knox Metal Wheel Co. and will remodel.

MISHAWAKA, IND.—Allen & Curtis Co., machinist, has been incorporated; $5,000 capital stock; by R. A. Allen, A. C. Curtis and M. M. Curtis.

NEWCASTLE, IND.—Chard Lathe Co., machinery, has been incorporated; $5,000 capital stock; by N. D. Chard, A. S. Long, J. L. McNab.

CHICAGO.—King Lock Co. has been incorporated; $200,000 capital stock; by Ray W. Hill, L. M. Baldwin and Chas. L. Cobb, 38 South Dearborn street.

CHICAGO.—Western Chandelier & Electrical Construction Co. has been incorporated; $10,000 capital stock; by Harold J. Finder, Samuel Woskow, et al.; Harold J. Finder, attorney, 117 North Dearborn street.

CHICAGO.—Spencer & Powers, 10 South LaSalle street, are receiving bids on the general contract for a $75,000 apartment building at Fifty-seventh and Dorchester avenue; will require steel columns with bases, steel girders, bearing plates and lintels.

CHICAGO.—A. S. Alschuler, 28 East Jackson Blvd., is preparing plans for Wm. H. Thompson, for a $300,000 warehouse, for the Ahrens & Ott Mfg. Co., 656 Washington Blvd.; it will be 116 x 183 feet, seven stories, with steel columns, base plates and cast bases, cast iron columns, beams, lintels, steel rods straps and anchors.

CHICAGO.—Mundie & Jensen, architects, have prepared plans for a factory and elevator building at 212 West Austin avenue for the Reliance Elevator Co., 312 West Ontario street. The structure is to be 65 x 100 feet, four stories; will require steel plate and angle steel protections, steel lintels and bearing plates, steel beams, tank supports and a 1,500 gallon tank.

EDWARDSVILLE, ILL.—Mount Olive & Staunton Coal Co. will install a $70,000 coal washing plant in Edwardsville, to have a capacity of 1,000 tons a day.

DETROIT.—Diamond Power Specialty Co. has increased its capital from $200,000 to $220,000.

DETROIT.—Storms Electric Co. has been incorporated; $10,000 capital stock; by William E. Storms, Frederick T. King, Ferdinand H. Zillisch, Charles J. King.

DETROIT.—Peninsular Machinery Co. has been incorporated; $10,000 capital stock; by Frederick Eberle, Arthur D. McElhose, John A. Flynn, Benjamin Middleditch.

DETROIT.—Baird Machine & Mfg. Co. has been incorporated; $20,000 capital stock; by William J. and Andrew Baird, Clara Manzelmann.

MARSHALL, MICH.—Simons-Leedle Furnace Co. has increased its capital from $15,000 to $25,000.

PORT HURON, MICH.—City raised by popular subscription the $100,000 necessary to obtain the large railroad shops of the Grand Trunk Railway Co.

BEAVER DAM, WIS.—Martin Mohr has broken ground on West Maple avenue for a two-story garage and machine shop or ornamental construction, costing about $8,000.

BEAVER DAM, WIS.—If the Beaver Dam Business Men's Association can make satisfactory arrangements for the lease or purchase of the upper mills plant of the Beaver Dam Woolen Mills Co., the Weyenberg Shoe Co., of Milwaukee, proposes to establish a branch plant in Beaver Dam, citizens are asked to raise $5,000 to help defray the expense of remodeling and repairing the plant.

ELKHART LAKE, WIS.—Sheboygan Railway & Electric Co., Sheboygan, Wis., is doing preliminary work on the proposed extension of its interurban line from this point to Chilton, Wis.; it is believed the company will start surveys early next spring; Edward Hammett is general manager.

FLORENCE, WIS. — Hastings Industrial Co., Chicago, has been awarded the general contract for erecting and equipping a dairy plant for the recently organized Florence Co-Operative Creamery Co.

JANESVILLE, WIS. — Janesville Electric Co. has increased its capital from $100,000 to $300,000.

MILWAUKEE, WIS. — American Metal Products Co.'s foundry was badly damaged by fire; loss about $15,000.

MILWAUKEE, WIS.—F. R. Dengel Mfg. Co., plumbers and steamfitters' supplies and materials, has increased its capital from $100,000 to $150,000.

MILWAUKEE, WIS.—Milwaukee structural firms have been advised that the Northern Coal & Dock Co., Superior, Wis., will install a new coal handling bridge, requiring not less than 200 tons, to replace a bridge which collapsed recently.

MILWAUKEE, WIS.—United States Steel Tie Co., capital stock $1,000,000, has been incorporated by L. W. Ashley, E. M. McVicker and E. Bub, all of Milwaukee, to engage in the manufacture of steel ties for railroads and tramways; the company is not yet ready to divulge its plans.

MILWAUKEE, WIS.—National Toy Mfg. Co., capital stock $10,000, which has been organized by A. L. Hentzen, A. C. Dick and A. L. Kleinboehl, intends to establish a large factory for the production of wood and metal toys and novelties to meet part of the requirements due to the stoppage of toy importations from Germany.

MILWAUKEE, WIS. — School board is planning to make the following improvements at once: Addition and new boiler house, Hopkins street school, $30,000; addition and manual training school building at South Division high school, $20,000; addition to Third street school, $75,000; plans are now being prepared by Van Ryn & DeGelleke, architects.

MILWAUKEE, WIS.—It is expected that plans for the $250,000 mercantile building to be erected on West Water street between Grand avenue and Wells street, for the Waldheim Furniture Co. by the Ticonic Investment Co., Milwaukee, will be ready for contractors by Jan. 15. As previously noted, the building will be ten stories, of brick, steel and terra cotta, 80 x 135 feet; the tonnage estimate is not yet ready for publication.

OSHKOSH, WIS.—Dauber & Kratsch Machine Co. was slightly damaged by fire.

OSHKOSH, WIS.—The board of education has commissioned Henry Auber, architect and engineer to prepare plans for a central heat and power plant to serve the Oshkosh Central high school, the high school annex and the Beach Manual Training institute.

OSHKOSH, WIS.—Bids will be taken about Jan. 2 by the state board of Normal school regents for the construction of the $100,000 addition to Oshkosh normal school. Plans being prepared by Van Ryn & DeGelleke, architects, Milwaukee, call for a concrete, steel and brick structure, three-stories, 44 x 246 feet, with steam heating system; William Kittle, Madison, is secretary.

ST. LOUIS.—George R. Richardson Machinery Co has been incorporated; $50,000 capital stock; by W. G. Meyers, H. J. Mann, K. B. Walsh, et al.

ST. LOUIS.—P. J. Bradshaw, 615 International Life building, has drawn plans for a $75,000 store and hotel building, 62 x 135 feet, six stories, of brick and reinforced concrete.

MUSCATINE, IA.—Preliminary work is being done on the construction of Garren & Hine's machine shop.

ROCK RAPIDS, IA. — Anchor Concrete Stone Co. has purchased a building and will install a foundry to be ready about Jan. 1.

DULUTH, MINN. — Cuyuna Mississippi Iron Co., mining, has been incorporated; $15,000 capital stock; by G. H. Wyman, Minneapolis; H. S. Lord, Carlton, Minn.; S. A. Jacobson, C. J. and H. E. Dodge, Moose Lake, Minn.

WINONA MINN.—Barnett & Record Co., Minneapolis, has the contract for the Bay State Milling Co.'s 500,000-bushel capacity elevator; plans call for concrete and steel construction and include eight tanks more than 100 feet high, and a working house of greater height to contain machinery for the handling and cleaning of wheat.

SOUTHERN STATES

NORFOLK, VA.—Empire Machinery & Supply Corporation has been organized with an authorized capital of $100,000, and has applied for a charter; H. E. Phillips, Suffolk, Va.; and J. G. McNeal, Burgaw, N. C., are among the directors.

SUFOLK, VA.—Nansemond county supervisors have plans prepared for a bridge to span the Nansemond river.

NEW ORLEANS.—Ford Bauck & Davis, 921 Canal street has plans for the Board of Commerce of the Port of New Orleans for a compress, sorting sheds, power house and warehouse to cost $1,000,000. Buildings will be of reinforced concrete and cover 727,000 square feet.

BROWNSVILLE, TEX.—Henry M. Wallace, Detroit and associates, owners of gas plants at Corpus Christi, Temple and Waxahachie, contemplate the erection of an artificial gas plant in Brownsville.

CORPUS CHRISTI, TEX.—City secretary will receive bids until 4 p. m., Dec. 29 for the construction of a watersystem; plans include pumping station, equipment and pressure filter plant; one 250,000-gallon elevated steel water tank; 79,564 lineal feet of 20-inch force pipe; certified check for $10,000 must accompany each proposal and the contractor must accept payment in city bonds at par and accrued interest.

DALLAS, TEX.—John B. Christensen, Box 948, is seeking prices on reinforcing rods for the Dallas & Southwestern Motor Way Co.

DRUMRIGHT, TEX.—Eureka Tool Co. has been incorporated; $12,000 capital stock; by V. H. Waldo, Frank Wolfe and Charles A. Towne.

FORT WORTH, TEX.—Southwestern Cooperage Co. has purchased a site and will erect a barrel factory, with a daily output of 600 casts.

GROESBECK, TEX. — Driscoll Pipe Line Co. has been incorporated; $200,000 capital stock; by Timothy J. Driscoll, Indianapolis, Ind.; Lewis E. Willet, Buffalo, N. Y.; Cornelius T. Herring, Amarillo, et al.

DRESDEN, TENN.—The municipality has voted $15,000 of bonds for the erection of a water plant and $12,000 for the construction of an electric light system.

NEWPORT, TENN.—J. W. Kyker will establish a hosiery mill shortly; the knitting equipment has been ordered, but the motors remain to be purchased.

WESTERN STATES

GRAND FORKS, N. D.—Rumely Products Co., machinery, is having plans prepared for a $75,000, 150 x 300-foot warehouse of metal structure; A. D. Adshead, manager.

GRAND FORKS, N. D.—Grand Forks Foundry & Machinery Co. was burned with about $1,000 loss.

KEARNEY, NEB.—Kearney Foundry Co. has sold the right to manufacture a babbitting

machine, recently patented, to William E. Gammel, Elmcreek, Neb., who will open a factory for its manufacture.

STAFFORD, KAN.—Local interests have subscribed for sufficient bonds to assure the erection of the $100,000 plant by the Valecia Milk Condensing Co., Madison, Wis.

GREAT FALLS, MONT.—The government is considering building a temporary railroad, 30 miles in length, from Gilman along the Sun river, to be used in connection with reservoir work.

GREAT FALLS, MONT.—Great Falls Sewer Pipe & Fireproofing Co. has been formed to construct a plant in Great Falls; about 30,000 feet of steam pipe will be used; grinding machinery and a power plant will be installed; total cost will be about $260,000.

ST. IGNATIUS, MONT.—United States reclamation service, St. Ignatius, will receive bids until Dec. 22 for work on laterals and sub-laterals which involves the placing of about 75,000 pounds of reinforcing steel.

SALT LAKE CITY.—Utah Ice & Storage Co. is having plans drawn for a $15,000 addition to its cold storage plant.

PRESTON, IDA.—Ogden, Logan & Idaho railway, formed from a consolidation of the Bamberger and Eccles interests, contemplates pushing the line to this place during the winter.

WALLACE, IDA.—A bond issue of $200,000 has been ratified by the Hypotheek Mining & Milling Co. for the erection of a mill and to supply other equipment.

EPHRATA, WASH.—Town plans a water plant pumping system to cost about $19,000.

HARRINGTON, WASH.—Fire slightly damaged the foundry department of the Harrington harvester factory.

SEATTLE.—Libby, McNeil & Libby, packers of Chicago, are requesting bids for the construction of a steamer, to cost about $75,000, for use in the Seattle-Alaska cannery trade.

SEATTLE.—Fidalgo Island Packing Co. has awarded a contract for a cannery tender to the John Wilson boat and shipyard on East waterway; it will be equipped with a four-cylinder, 150-horsepower new type Frisco standard engine and a six-horsepower auxiliary engine for lights; L. E. Geary, Seattle, architect.

SEATTLE.—A business man in South America requests an American consular officer to put him in touch with American manufacturers of small electric, kerosene and gasoline motors, also portable motor plants for small boats. An electric light company in South America informs an American consular officer that it is desirous of receiving catalogs from American manufacturers of electrical appliances of all kinds, except power plant equipment. Further information on these inquiries can be had of W. B. Henderson, bureau of foreign and domestic commerce, 1207 Alaska building, Seattle.

BAKER, ORE.—Council is considering a $97,776 bond issue for the installation of an electric light plant.

HELIX, ORE.—Freular & Dyer Engineering Co., Walla Walla, Wash., has succeeded in interesting local capital in the matter of an electric light plant here, to have a 22-horsepower crude oil engine with 20-horsepower generator; work will start shortly.

PORTLAND, ORE.—Wahkiakum Timber Co. has been incorporated; $300,000 capital stock; by Robert Treat Platt, et al.

PORTLAND, ORE.—Bids were opened Dec. 1 for the purchase of the remaining $1,000,000 in Multnomah county interstate bridge bonds.

LOS ANGELES.—Double Quantity Pump Mfg. Co. has been incorporated; $100,000 capital stock; by D. J. Muncey, W. H. Smith, et al.

SAN FRANCISCO.—National Mfg. Co., machinery, has been incorporated; $75,000 capital stock; by C. H. Holt, J. P. Levelle, J. H. Rice, L. A. Fitzgerald, S. J. Kellogg, 948 Market street.

New Trade Publications

PACKINGS.—A bulletin devoted to its line of leather packings has been published by the Watson-Stillman Co., 55 Church St., New York. Tables are given showing sizes and prices of the different types of packings.

WHEELS.—The Pressed Steel Wheel Co., Los Angeles, Cal., recently organized to manufacture a pressed steel wheel, has issued a bulletin describing its product. Accounts are given of tests which show the strength and serviceability of this wheel.

AUTOMATIC MOTOR STARTERS.—The Cutler-Hammer Mfg. Co., Milwaukee, is sending to the trade a folder illustrating and describing its automatic motor starter and numerous applications of this device to various types of equipment are illustrated.

ELECTRIC DRILLS.—In a four-page circular, issued by the Independent Pneumatic Tool Co., Chicago, its extensive line of portable electric drills is illustrated and described. These drills are equipped throughout with ball and roller bearings and are furnished with either alternating or direct current motors.

PUMPS. — An interesting, profusely illustrated, 48-page catalog of cycloidal pumps has been issued by the Connellsville Blower Co., Connellsville, Ind. These pumps are suitable for handling water, oil, tar, ammonia, liquid lard and chemical solutions. They are built in two types with two or three lobes, respectively. Illustrations of pumps installed in plants throughout the country are shown and complete details regarding their construction and operation are presented.

INSULATION.—The Continental Fibre Co., Newark, Del., has issued a 46-page catalog which is devoted to its line of insulating materials and points out the physical qualities which render these adaptable to a wide range of mechanical applications. The catalog is printed in two colors and contains price lists.

WOOD BORING TOOLS.—The W. A. Ives Mfg. Co., Wallingford, Conn., which has been manufacturing auger bits recently has added a complete line of chisels and braces. A bulletin recently issued by this company is devoted to these new products and contains illustrations and descriptions of the various types which the company manufactures.

COMPRESSORS. — A 16-page, loose-leaf catalog, issued by the Chicago Pneumatic Tool Co., Chicago, is devoted to small power-driven compressors, a portable combination pneumatic plant being shown which has wide application in all industrial works. Single and double cylinder compressors also are shown, as well as those of the water-cooled, electric gear-driven and other types.

WHEELS.—A 64-page catalog recently has been issued by the Lehigh Car, Wheel & Axle Works, Catasauqua, Pa. The book is printed on a high grade of paper and contains illustrations and price lists covering face hardened sprocket and traction wheels manufactured by the company with a general description of the special castings manufactured by this company for all uses requiring resistance to abrasive wear.

PORTABLE TOOLS.—The line of portable electrically driven tools manufactured by the Neil & Smith Electric Tool Co., Cincinnati, is described in a 56-page catalog which recently has been published. The tools described include grinders, buffers, drills, screw drivers, circular saws, etc. An interesting feature of the catalog is a description of the company's speed changing device, which is installed on its line of grinders. The catalog is handsomely illustrated.

VENTILATORS. — An interesting 48-page catalog has been issued by the Royal Ventilator Co., Philadelphia, and is devoted to a description of the extensive line of ventilators manufactured by this company. The catalog contains data on the different types of ventilators which are available for use on all types of buildings from a train shed to a barn, and including school houses, foundries, factories, brass works, bridge companies, cement plants, iron and steel works, machine shops and power plants. Testimonials from a number of architects and engineers also are given.

COMPRESSORS.—A bulletin recently issued by the Chicago Pneumatic Tool Co., Chicago, contains illustrations and descriptions of the various types of small power driven compressors which this company manufactures.

IRON SHOES.—The Marion Malleable Iron Works, Marion, Ind., recently has published a 136-page catalog devoted to its line of malleable iron shoes for continuous stave pipe and giving information on malleable iron castings. The fore part of the book is devoted to a complete and interesting account of the early history of iron leading up to the discovery of the malleable iron process. The book is handsomely illustrated with views of the different types of shoes manufactured by the Marion company and contains hydraulic tables and useful formulas which will prove of value to users of this type of equipment.

RIVETS.—A handsomely illustrated catalog containing 136 pages, recently has been issued by the Champion Rivet Co., Cleveland, under the title of "Scientific Facts." The book contains information about the line of boiler, structural and ship rivets manufactured by this company. In the preface the company points out interesting details of its growth during the past 20 years. The first shop which began operation in 1894 was equipped with one rivet making machine. The company now has two plants in full operation and operates more than 70 machines. A number of pages are devoted to the results of physical and chemical tests conducted on these rivets, the results of which show the quality of the metal and its suitability for the highest grade of boiler rivets. A number of valuable tables are printed while several chapters are devoted to essays on "How to Heat and Drive Good Steel Rivets."

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to April 1.)

Bessemer, valley	$13.75 to 14.00
Bessemer, Pittsburgh	14.70 to 14.95
Basic, Pittsburgh	13.45 to 13.60
Basic, eastern Pa.	13.50
Malleable, Pittsburgh	13.70 to 13.95
Malleable, Chicago	13.00 to 13.50
Malleable, Philadelphia	14.50 to 15.00
Malleable, Buffalo	13.00 to 13.25
No. 1X, Phladelphia	14.75 to 15.00
No. 2 foundry, Pittsburgh	13.70 to 13.95
No. 2 foundry, Cleveland	13.25 to 13.50
No. 2 foundry, Ironton	12.75
No. 2 foundry, Chicago	13.00 to 13.50
No. 2X foundry, Philadelphia	14.25 to 14.50
No. 2X fdy., (N. J. tidewater)	13.75 to 14.25
No. 2X foundry, Buffalo	13.00 to 13.25
No. 2 plain, Philadelphia	14.00 to 14.25
No. 2 plain, (N. J. tidewater)	13.75 to 14.00
No. 2 plain, Buffalo	12.75 to 13.00
No. 2 southern, Birmingham	9.75
No. 2 southern, Cincinnati	12.65
No. 2 southern, Chicago	14.00 to 14.25
No. 2 southern, Phila. delivery	14.50
No. 2 southern, Cleveland	13.75 to 14.00
No. 2 south'n, New York, docks	14.00 to 14.25
No. 2 southern Boston, docks	14.00 to 14.25
No. 2 south'n, interior New Eng.	15.00 to 16.00
No. 2 southern, St. Louis	14.00 to 14.25
Virginia No. 2X furnace	12.25 to 12.75
Virginia 2X, Philadelphia	15.00 to 15.25
Virginia 2X, Jersey City	15.25 to 15.50
Virginia 2X, Boston points	15.50 to 15.75
Gray forge, (eastern Pa.)	13.50 to 13.75
Gray forge, Pittsburgh	13.45 to 13.70
Gray forge, Birmingham	9.00 to 9.50
Silveries, 8 per cent, Cleveland	17.63
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	19.00 to 20.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16 50
Charcoal, Buffalo	15.75 to 16.75
Charcoal, Birmingham	25.00

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7c
Foreign non-Bess., 50 to 65 per cent	7c

COKE

(At the ovens.)

Connellsville furnace	$1.60 to 1.75
Connellsville fur. contr.	1.70 to 1.75
Connelleville foundry	2.00 to 2.40
Connellsville fdy., contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.10 to 2.40
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro-manganese, Baltimore	$68.00
Ferro-silicon, 50 per cent, Pbgh.	$71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open-hearth billets, Phila.	$21.40 to 21.90
Forging billets, Phila.	24.40 to 25.40
Forging billets, Pbgh. (nom.)	24.00 to 24.50
Wire rods, Pittsburgh	25.00 to 26.00
Billets, Pbgh. and Ygnst.	18.50 to 19.00
Sheet bars, Pbgh. and Ygnst.	19.50 to 20.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama Canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.25
From Pittsburgh	.41
From Youngstown	.43
From Niles	.43
From Wheeling	.41
From Steubenville	.41
From Johnstown	.395
From Coatesville	.34
From Steelton	.35
From Bethlehem	.325
From Cleveland	.44
From Chicago	.55

Lgt. rails, 8 lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs., Pbgh. & Chgo.	1.17c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$ .95
Newark, N. J.	2.85
New England	2.85
Philadelphia	2.65
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.20
New England (all rail)	2.45
New York and Brooklyn (all rail)	2.45
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York docks (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville,, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Lgt. rails, 16 to 20 lbs., Pbgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh., and Chgo.	1.07c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.35c to 1.40c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	2.00c
Track bolts, Chgo.	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.10c
Structural shapes, Chicago	1.24c to 1.29c
Structural shapes, Philadelphia	1.20c to 1.25c
Structural shapes, New York	1.21c to 1.26c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.19c to 1.29c
Tank plates, Pittsburgh	1.05c to 1.10c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.25c to 1.30c
Bars, soft steel, Pittsburgh	1.10c
Bars, soft steel, Chicago	1.19c to 1.29c
Bars, soft steel Philadelphia	1.25c to 1.30c
Bars, soft steel, New York	1.26c to 1.31c
Hoops, carloads, Pittsburgh	1.25c
Hoops, less carloads, Pittsburgh.	1.30c
Bands, Pittsburgh	1.10c
Shafting, carloads, Pbgh., disc. contract	66 to 67
Shafting, less carl'ds, Pbgh., disc.	63
Bar iron, Chicago	0.95c to 1.00c
Bar iron, Philadelphia	1.12c to 1.19c
Bar iron, New York	1.10c to 1.20c
Bar iron, Cleveland	1.15c
Bar iron, Pittsburgh	1.20c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish. mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.85c
No. 28, black, Chicago	2.04c to 2.09c
No. 28, tin mill, black, Pbgh.	1.90c
No. 28, galvanized, Pbgh.	2.80c to 2.85c
No. 28, galvanized, Chgo.	2.99c to 3.04c
No. 10, blue, annealed, Pbgh.	1.35c to 1.40c
No. 10, blue, annealed, Phila.	1.45c to 1.50c
Tin plate, 100 lb., coke base	$3.20

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll., and re-an.	30 cents
Hot roll'd, pickl'd and ann., tin mill	25 cents
Full pickl'd, cold rolled and re-ann.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller levelling	10 cents
Patent levelling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open-hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents
No reduction for sheets not annealed.	

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsbugh.)

	Black Butt-weld.	Galv.
Steel, ¾ to 3 inches	81	72½
Iron, ¾ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	80	71½

BOILER TUBES

Steel, 3½ to 4½ inches	73
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.50 to 1.55
Wire nails, retailers, Pittsburgh	1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.30 to 1.35
Plain wire retailers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.70 to 1.75
Galvanized wire, retailers, Pbgh.	1.75 to 1.80
Polished staples, Pbgh.	1.50 to 1.55
Galvanized staples, Pbgh.	1.90 to 1.95
Barb wire, painted, jobbers, Pbgh.	1.50 to 1.55
Barb wire, painted, retail'rs, Pbgh.	1.55 to 1.60
Barb wire, galv., retail's, Pbgh.	1.95 to 2.00
Barb wire, galv., jobbers, Pbgh.	1.90 to 1.95

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 20; cut threads 80 and 15; larger or longer, 75 to 15.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 25; cut, 80 and 20; larger or longer, 80.

Gimlet and cone point lag or coach screws, 80 and 25.

Hot pressed square, blank or tapped nuts, $6.30 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, c. and t. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅝ inch and larger, $7.20; ⅝-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh	1.45c to 1.50c
Structural rivets, Chgo	1.68c
Boiler rivets, Pbgh	1.55c to 1.60c
Boiler rivets, Chgo	1.78c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

COLD ROLLED STRIP STEEL

(Subject to regular extras.)

Base price		0.10 to 0.19
Cut to length		Cabon
Hard.	Soft.	1½ in. and wider.
2.85	3.10	0.100 and thicker.
2.95	3.20	0.050 to 0.099 inc.
3.10	3.35	0.035 to 0.049 inc.
3.35	3.75	0.031 to 0.034 inc.
3.60	4.00	0.025 to 0.030 inc.
3.80	4.20	0.020 to 0.024 inc.
4.70	5.20	0.017 to 0.019 inc.
5.10	5.60	0.015 and 0.016
5.95	6.45	0.013 and 0.014
6.55	7.05	0.012
6.90	7.40	0.011
7.25	7.75	0.010
Coils		
2.75	3.00	0.100 and thicker
2.80	3.05	0.050 to 0.099 inc.
2.95	3.20	0.035 to 0.049 inc.
3.10	3.50	0.031 to 0.034 inc.
3.20	3.60	0.025 to 0.030 inc.
3.30	3.70	0.020 to 0.024 inc.
3.60	4.10	0.017 to 0.019 inc.
4.00	4.50	0.015 and 0.016
4.70	5.20	0.013 and 0.014
5.05	5.55	0.012
5.40	5.90	0.011
5.75	6.25	0.010

CAST IRON PIPE

Three to 20 in., Cleveland	$21.50
Twenty-four to 48-inch, Cleveland	21.00
Four-inch, water, Chicago	26.00
Six to 12 inches, Chicago	24.00
Larger sizes, Chicago	23.50
Six-inch, water, New York	20.00 to 20.50
Four-inch, water, Birmingham	19.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.70c to 1.75c
Steel bars, New York	1.80c
Steel bars, St. Louis	1.70c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, St. Louis	1.65c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.70c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, St. Louis	1.80c
Shapes and plates, Philadelphia	1.70c to 1.75c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo	1.95c
No. 10 blue ann. sheets, Cleve	2.05c
No. 10 blue ann. sh., St. Louis	2.00c
No. 10 blue ann. sheets, Cinci	1.95c
No. 28 black sheets, Chgo	2.55c
No. 28 black sheets, Cleveland	2.45c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 black sheets, St. Louis	2.55c
No. 28 galv. sheets, Chgo	3.55c
No. 28 galv. sheets, Cleveland	3.35c
No. 28 galv. sheets, Cincinnati	3.40c to 3.55c
No. 28 galv. sheets, St. Louis	3.55c

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—

Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

No. 1 railroad wrought, Chgo	$ 7.50 to 7.75
No. 1 railroad wrought, Cleve	9.00 to 9.50
No. 1 railroad wrought, St. L	7.50 to 7.75
No. 1 railroad wrought, Cincin	8.00 to 8.50
No. 2 railroad wrought, Chgo	7.00 to 7.25
No. 2 railroad wrought, St. L	7.25 to 7.50
Arch bars and transoms, Chgo	10.50 to 11.00
Arch bars and transoms, St. L	10.50 to 11.00
Knuckles, coup. & sp'gs, Chgo	8.75 to 9.00
Knuckles, coup. & spr'gs, St. L	8.50 to 8.75
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	10.50 to 11.00
Steel car axles, Chicago	10.50 to 11.00
Steel car axles, St. Louis	10.50 to 11.00
Locomotive tires, Chicago	9.00 to 9.50
Locomotive tires, St. Louis	8.50 to 9.00
Cut forge, Chicago	7.00 to 7.25
Pipes and flues, Chicago	5.75 to 6.00
Pipes and flues, Cleveland	6.75 to 7.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11.6 cents
Baltimore	14½ cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, (all rail)	80 cents
Pacific coast, via Panama canal	41 cents

Pipes and flues, St. Louis	5.50 to 5.75
No. 1 cast, Chicago	9.00 to 9.25
No. 1 cast, Cleveland	9.50 to 10.00
No. 1 cast, Cincinnati	8.50 to 9.00
No. 1 cast, St. Louis	9.00 to 9.25
No. 1 busheling, Chicago	6.50 to 6.75
No. 1 busheling, Cleveland	8.00 to 8.25
No. 1 busheling, Cincinnati	5.75 to 6.25
No. 1 busheling, St. Louis	7.25 to 7.50
No. 2 busheling, Chicago	5.25 to 5.75
No. 1 boiler plate, cut, Chigo	5.50 to 5.75
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L	5.50 to 5.75
Boiler punchings, Chicago	8.25 to 8.75
Cast borings, Chicago	4.50 to 5.00
Cast borings, Cleveland	5.50 to 5.75
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.00 to 4.50
Machine shop turnings, Chicago	4.50 to 4.75
Machine shop turnings, Cleveland	5.00 to 5.25
Machine shop turnings, Cinci	4.25 to 4.75
Machine shop turnings, St. L	4.50 to 5.00
Malleable agl., Chicago	7.50 to 7.75
Malleable agricultural, St. Louis	6.00 to 6.25
Malleable, railroad, Chicago	7.75 to 8.25
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	6.25 to 6.50
Angle bars, iron, Chicago	10.50 to 11.00
Angle bars, iron, St. Louis	9.50 to 10.00
Angle bars, steel, Chgo	7.75 to 8.00
Angle bars, steel, St. Louis	8.50 to 8.75
Stove plate, Chicago	8.25 to 8.50
Stove plate, Cleveland	7.50
Stove plate, Buffalo	9.00 to 9.75
Stove plate, Cincinnati	6.50 to 7.00
Stove plate, St. Louis	7.00 to 7.25
Bundled sheet, Cincinnati	4.00 to 4.50

(Gross Tons.)

Heavy melting steel, Pbgh	$10.25 to 10.75
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	8.00 to 8.50
Heavy melting steel, Cleveland	9.00 to 9.50
Heavy melting steel, Cincinnati	9.00 to 9.50
Heavy melting steel, eastern Pa.	9.00 to 9.50
Heavy melting steel, New York	7.50 to 7.75
Heavy melting steel, St. Louis	10.50 to 11.00
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.00 to 9.25
Grate bars, New York	6.50 to 7.00
No. 1 railroad wrought, east. Pa.	11.00 to 11.50
No. 1 railroad wrought, Pbgh	10.00 to 10.50
No. 1 R. R. wght., New York	9.00 to 9.50
No. 1 R. R. wrought, Buffalo	10.00 to 10.50
Shafting, New York	11.00 to 11.50
Shafting, eastern Pa.	13.50 to 14.00
Wrought pipe, New York	7.25 to 7.50
Wrought pipe, eastern Pa.	9.25 to 9.75
Mch. shop turnings, New York	5.00 to 5.25
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh	8.00 to 8.25
Mch. shop turnings, eastern Pa.	7.75 to 8.00
Cast borings, New York	5.00 to 5.25
Cast borings, eastern Pa.	7.75 to 8.00
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	8.00 to 8.50
Stove plate, (Jersey points)	8.00 to 8.50
Stove plate, Pittsburgh	8.50 to 8.75
Stove plate, eastern Pa.	8.00 to 8.50
Shoveling steel, Chicago	7.25 to 8.00
Shoveling steel, St. Louis	8.00 to 8.50
Reroll'g rails, 5 ft. & ov., Pbgh	11.50 to 11.75
Reroll, rails, 5 ft. & ov., Chgo	9.50 to 9.75
Reroll, rails, 5 ft. & ov., Cleve	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa	10.50 to 11.00
Reroll. rails, 5 ft. & ov., St. L	9.75 to 10.00
Steel rails, short, Chicago	9.00 to 9.50
Steel rails, short, Cleveland	11.00 to 11.50
Steel rails, short, St. Louis	9.25 to 9.50
Iron rails, Cleveland nom	11.75 to 12.00
Iron rails, Cininnati	10.25 to 10.75
Iron rails, eastern Pa.	13.50 to 14.00
Iron rails, St. Louis	10.25 to 10.50
Iron rails, Pittsburgh	13.00 to 13.50
Frogs, switches, guards, Chgo	8.50 to 8.75
Frogs, switches & g'rds, St. L	9.25 to 9.50
Car wheels, (iron), Pittsburgh	10.50 to 11.00
Car wheels, (steel), Pittsburgh	11.50 to 12.50
Car wheels, Chicago	10.00 to 10.25
Car wheels, eastern Pa.	9.50 to 10.00
Car wheels, Buffalo	10.50 to 11.00
Car wheels, (N. J. points)	9.25 to 9.50
Car wheels, St. Louis	10.25 to 10.50
Iron axles, Pittsburgh	18.00 to 19.00
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa.	18.50 to 19.00
Iron axles, Buffalo	19.00 to 19.50
Iron axles, Chicago	15.00 to 15.50
Steel car axles, New York	11.00 to 11.50
Steel car axles, Buffalo	12.00 to 12.50
Steel car axles, Cleveland	12.00 to 12.50
Steel car axles, eastern Pa.	13.00 to 13.50
No. 1 busheling, Buffalo	8.25 to 8.75
No. 1 busheling, Pittsburgh	8.50 to 8.75
No. 2 busheling, Buffalo	5.75 to 6.25
Low phosphorus steel, Buffalo	14.00 to 14.50
Low phosphorus steel, Pbgh	12.75 to 13.25
Low phos. steel, eastern Pa.	13.50 to 14.00
No. 1 forge, eastern Pa.	8.00 to 8.25
No. 1 cast, eastern Pa.	11.50 to 12.00
No. 1 cast, Pittsburgh	10.75 to 11.00
No. 1 heavy cast (N. J. points)	10.25 to 10.50
Mall. iron, agricul., Cleveland	9.00 to 9.50
Mall iron R. R., Cleveland	9.00 to 9.25
Malleable, railroad, Pittsburgh	9.75 to 10.00
Mall., R. R., Buffalo	9.25 to 9.75
Mall., R. R., east. Pa.	8.50 to 9.00
Bundled sheet, Pittsburgh	8.00 to 8.50
Bundled sheet, Cleveland	7.50

High-Grade Tin and Terne Plates
Genuine Charcoal and Iron Terne Plates

The Carnahan Tin Plate & Sheet Company

Canton, Ohio

Specialties → Blued and Polished Steel, Deep Drawing Steel, Automobile Sheets, Full Finished Enameling and Ceiling Stock, Etc.

Woodmansee & Davidson, Inc.
ENGINEERS
All Kinds of Power Plants
SPECIALISTS in the Industrial Application of PRODUCER GAS
MILWAUKEE, Wells Bldg. CHICAGO, 1st National Bank

Belle City Malleable Iron Co.
MALLEABLE IRON
CASTINGS
RACINE, WISCONSIN

Axles For Passenger or Freight Cars and Locomotives
"Pollak" Special Heat Treated Steel
Open Hearth, Nickel or Vanadium Steel

MARINE MACHINE and ENGINE Forgings
From 10 lbs. to 100,000 lbs. each of every shape and description
THE POLLAK STEEL CO., Cincinnati, Ohio

MALLEABLE CASTINGS
We positively guarantee Quality and Deliveries.
THE COLUMBUS MALLEABLE IRON CO.
COLUMBUS, OHIO

Name Plates Light Stampings
All Finishes
We also polish, plate or enamel these if desired.
The Chandler Co. Springfield, Mass.

SCIENTIFICALLY HEAT TREATED
DROP FORGINGS
Send for Booklet
The Steel Improvement Company
CLEVELAND, OHIO

Electric Steel—I

(*Continued from page* 1082)

before the furnace engineering was as well understood as it is today, some furnace shells were made of copper and of manganese steels for electric reasons, but it is now practical to design shells entirely of steel. In some forms of furnaces the shell is laminated, made up of a number of layers. This form of construction gives a low radiation loss. The joints between the layers interpose a large resistance to the flow of heat. It is the same reason that makes it take so long to boil an onion, with its laminated structure.

As electric heat is relatively expensive, the doors of an electric steel furnace are built to let out as little heat as practical. For this reason they are made thick, much thicker than open-hearth doors. At the usual charge for electricity a regular open-hearth door would leak about three dollars worth of heat each 24 hours. A convenient form of electric steel furnace door is made in the form of a plug mounted to swing in vertical trunnions. This does away with counter weights and permits the door being made thick enough to reduce the leakage to a small amount.

The lining bricks around the doors usually suffer severely from the heat and from exposure to cold draughts when the door is opened. It is also subject to severe mechanical strains while hot, when the furnace is tilted. To meet these conditions, the door frames are frequently made round, so that the brickwork can be built into the form of a self-supporting arch. This arch not only holds the weight of the roof, but also the side crushing strains due to the expansion of the side walls with the heat.

(*To be continued*)

Uniform Design of Crane Wheels

(*Continued from page* 1087)

to an increase of ¾ inch in throat thickness. It is obvious, however, that in increasing the throat depth without altering flange thickness a point would soon be reached where further increase of throat depth would have little or no effect on flange strength, since the flange would not be strong enough to transmit the stress to the full depth of the throat. These results are shown in Figs. 8-10.

The line of fracture was usually at an angle of about 30 degrees with the plane of the wheel and the length of the fracture was roughly proportional to the flange thickness; in other words, a thick flange tends to produce a long fracture. For consistent design there should be a fixed relation between flange thickness and throat thickness. Stated as a proportion, flange thickness is to throat thickness as two is to three. Stating this relation in another way—the addition of ½ inch of metal to the flange is equivalent to adding ¾ inch of metal to the throat. In general, the results obtained demonstrated that it was possible to design wheel flanges of chilled iron with absolute certainty that they would safely carry loads far in excess of the greatest used in present-day practice. Table IV gives the safe strength of crane wheel flanges using a factor of safety of five. Figs. 11 to 16, inclusive, show the curves of safe strength of various thicknesses of flanges on various diameters of wheels.

Wheels with Worn Flanges

Arguments have been presented that the thickness of flange does not increase the strength of flanges and that worn flanges do not break more frequently than those with comparatively little wear. Tests were made on 30-inch wheels with 1¼-inch, 1½-inch and 1¾-inch flanges ground out on the inside of the flange to the contour of a badly-worn flange. These flanges were broken in the same manner

as in the other tests, but the load was applied ⅜ inch above the tread of the wheel.

Fractures in these tests were without premonitory cracking or else occurred almost immediately after the first crack was observed. As a rule, the planes of fracture were shorter than was the case with new flange sections, and the plane of fracture was at an angle of about 45 degrees instead of an angle of 30 degrees, as was the case with new flanges. The per cent of reduction in strength of the flanges was greater than the per cent of reduction of section of metal in the flange.

While the strength of flanges on 33-inch Master Car Builders' wheels has no direct bearing on the flanges of crane wheels, this datum is given to show that chilled iron possesses all the qualities that are required in heavy wheel service, and that a design can be made to carry any load if all the requirements are taken into consideration. The value of chilled iron for wheels to carry the heaviest concentrated loads is generally recognized. This is shown in crane work and other locations where loads of 100,000 pounds and upwards are required per wheel. A good many crane builders have used the standard Master Car Builders' flange on wheels for crane service. This certainly is not correct, for in railroad service the thickness of flange is limited on account of crossings, switches, guard rails, etc., while in crane service, where the load carried by the wheel and the resulting flange pressure is several times greater than encountered in railroad service, there is unlimited space for designing flanges in proportion to the work which they must perform. Furthermore, for heavy cranes, where the expense of changing wheels is large, and in case of renewals keeps the crane idle, an ample factor of safety should be used. This is also essential on wheels having two flanges, when the rail is out of level, giving excess work on one wheel, or the track is out of alignment, which changes the track gage, and one flange receives considerably more stress than calculated.

Standard Design for Crane Wheels

The foregoing tests furnish data from which crane manufacturers can decide for any given condition the rail to be used, the diameter of wheel and proper flange section. The diameter of wheel is based on economic power consumption, necessary clearances, etc., for the particular crane or tower in question. The flange pressure cannot be calculated directly, but on account of irregularities in track and other operating conditions, it is necessary that the section of flange shall safely resist a horizontal pressure equal to 75 per cent of the vertical load. The safe vertical load for any wheel is largely based upon the section of flange that will safely guide the load rather than upon the ability of the body of the wheel to sustain the load.

The use of uniform standards would eliminate the cost of special patterns and equipment, which often amount to as much or more than the wheels themselves, and permit of prompt manufacture. As a step in this direction, a complete set of designs has been prepared, ranging from 12-inch to 36-inch wheels, each diameter being represented by several different designs for light, medium and heavy operating conditions. Table V is a tabulated list of wheels of various flange and throat or tread thicknesses, as well as the safe load and flange pressure for each design.

A new bulletin, just issued by the General Electric Co. is devoted to the subject of alternating current generators for direct connection to reciprocating engines. The object of the bulletin is to illustrate and describe some of the recent improvements in the alternators built by the company for direct connection to steam, oil and gas engines. The construction of the alternator is illustrated and described in considerable detail, and the bulletin contains data relative to dimensions, capacities, weights, etc., of alternators of this description.

CONVERTER STEEL CASTINGS

ANYTHING UP TO 2500 POUNDS

Our large modern plant, consisting of a foundry 160x80 feet; machine shop 400x80 feet, and a large pattern shop, complete in every detail, enables us to turn out promptly and at the lowest price anything in Converter Steel Castings up to 2500 pounds, and in gray iron up to 10 tons.

WRITE US.

The Adamson Machine Co.
AKRON OHIO

TISCO MANGANESE STEEL CASTINGS
FOR SEVERE SERVICE
Taylor-Wharton Iron & Steel Co.
High Bridge, New Jersey

SMALL STEEL CASTINGS
OF THE BEST QUALITY ARE OUR SPECIALTY. WRITE US.
FARRELL-CHEEK STEEL FOUNDRY CO.
SANDUSKY, OHIO

RIVETS, BURRS,
BOLTS and SCREWS
The Falls Rivet Co. Kent, O.

STEEL PLATE CONSTRUCTION
Riveted and Welded Tanks
of every description
ACME BOILER WORKS, Canal Dover, O.

Opportunities

Men Wanted
Minimum, 50 words, $1.00. Each additional word, 2c. All capitals, 50 words, $1.50. Each additional word, 3c.

Position Wanted
Minimum, 25 words, 50c. Each additional word, 2c. All capitals, 25 words, 75c. Each additional word. 3c.

Miscellaneous Classified
Minimum, 25 words, $1.00. Each additional word, 4c. All capitals, 25 words, $2.00. Each additional word, 8c.

Men Wanted

UNDERSIGNED COUNSEL WILL CONFIDENTIALLY negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $3,000 to $12,000 men. Send address only for explanation. R. W. Bixby, Lock Box 134-E9, Buffalo, N. Y.

WANTED: — SUPERINTENDENT FOR MALLEABLE IRON FOUNDRY (CAPACITY 25 TONS PER DAY). ONLY HIGH GRADE MAN WITH EXECUTIVE ABILITY NEED APPLY, WHO FULLY UNDERSTANDS THE REQUIREMENTS OF EACH DEPARTMENT TO PRODUCE BEST QUALITY CASTINGS AT LOW COSTS. ADDRESS BOX 280, THE IRON TRADE REVIEW, CLEVELAND, O.

THE BEST WAY TO GET A GOOD POSITION in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—ROLLER ON 14 AND 20-inch merchant iron trains, one thoroughly familiar with the rolling of guide and hand rounds. Give references, addressing Box 285, THE IRON TRADE REVIEW, Cleveland.

WANTED: AN EXPERIENCED MANaging foreman to take charge of a modern, up-to-date machine foundry. Experience in molding and casting boilers required. Permanent to right party. Send references and full qualifications. Economy Boiler Co., Willmar, Minn.

ROLLER, FIRST-CLASS BAR, IN IRON mill, central west. Address with references and full particulars, Box 287, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: EXPERIENCED SUPERINtendent for ornamental iron shop in western New York. Must be thoroughly competent to lay out work from architects plans and take full charge to completion. Reply stating qualifications. Address Box 289, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—AN EXPERIENCED BLAST furnace SUPERINTENDENT, used to making high grade foundry irons, at an up-to-date Pennsylvania plant. Reply, giving copies of references and other particulars, to Box 291, THE IRON TRADE REVIEW, Cleveland.

WANTED:—AN EXPERIENCED BLAST furnace CHEMIST. Must be well recommended. Reply to Box 292, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—TWO COMPETENT BLAST furnace BLOWERS or FOREMEN. Send copies of references and other particulars to Box 293, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

POSITION WANTED AS FOUNDRY superintendent or foreman; experienced in molding machines, match plates, melting iron and handling men. Stove foundry preferred. Address Box 204, THE IRON TRADE REVIEW, Cleveland, O.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman or any technical man, consult The Engineering Agency, Inc., (Est. 21 years) 1662 Monadnock Block, Chicago.

ASSISTANT SUPERINTENDENT, OPEN hearth plant, desires change to similar capacity; nine years' experience; high executive ability; would consider change to some other branch of steel business; capable organizer of all kinds of labor. Address Box 213, THE IRON TRADE REVIEW, Cleveland, O.

GRADUATE MECHANICAL ENGINEER with three years' practical experience desires location. Has served as head draftsman in an engine and boiler company employing 400 men. Last employed as superintendent of small company making high grade gasoline motors. Salary dependent on location. Address RBJ, care of THE IRON TRADE REVIEW, Cleveland, O.

CHEMIST (GRADUATE), TWO YEARS' experience in iron and steel laboratory, wants position as assistant or take charge of small laboratory. Address Box 288, THE IRON TRADE REVIEW, Cleveland, O.

MARRIED MAN, WITH FOURTEEN years' experience in shop and drawing room, wants position as structural steel foreman or superintendent; can furnish first-class references; am working at present. Address Box 290, THE IRON TRADE REVIEW, Cleveland, O.

For Rent

MOST DESIRABLE SUITE OF OFFICES IN PITTSBURGH, 5th AVENUE FRONT PARK BUILDING, ROOMS 603 & 604. HAVE OCCUPIED THEM FOR 12 YEARS OR MORE. LEASE EXPIRES MAY 1st, 1916. MOVING OFFICES TO FACTORY REASON FOR RELINQUISHING. ADDRESS PITTSBURGH EMERY WHEEL COMPANY, ROCHESTER, PA.

Sales Agents

FOREIGN SALES REPRESENTATIVE
Danish mechanical engineer, 28, with good connections in Denmark, Norway and Sweden, would like to represent responsible machinery firm. Address Box 273, THE IRON TRADE REVIEW, Cleveland, O.

Opportunities

A MANUFACTURING OPPORTUNITY!
I want to effect manufacturing and sales arrangements to market my patented invention which removes slag from slag pockets of open hearth steel furnaces. It directly increases tonnage and reduces operating expense because shutting down to clean out is eliminated. If interested in a good proposition, address Box 283, THE IRON TRADE REVIEW, Cleveland, O.

For Sale

EASTERN FOUNDRY FOR SALE;
well equipped, advantageously located, has excellent transportation facilities both rail and water; can be bought at attractive price on favorable terms. G. B. W., 114 Liberty street, New York.

A REAL BARGAIN!
I desire to retire from active business and offer my completely equipped foundry for sale at a PRICE THAT WILL INTEREST YOU if looking for an actual bargain. Plant is well located with plenty of work and is now in full operation. Recent inventory of plant and stock totaled $20,000; can be bought at practically YOUR OWN TERMS AT CONSIDERABLY LESS than this figure, if taken now. Will deal with principals only. For detailed particulars, address Box 270, THE IRON TRADE REVIEW, Cleveland, O.

PATENT FOR SALE:—PHOENIX LOCK dumping grate, states of Pennsylvania and Ohio. Apply Edward Gibson, 170 First street, Jersey City, N. J.

MISCELLANEOUS "FOR SALE", "Wanted," "Investments" and "Opportunities" ads represent the greatest publicity value obtainable—and they're not expensive either. A demonstration will convince you that they produce results.

R. R. Laborers

BEST OF AMERICANS AND FOREIGNers for track and construction work; we get the right kind of help supplied free of charge to employers; your patronage solicited. We are also boarding contractors, one man or a train load laborers and tradesmen for foundry and factory. Write, wire or phone. Diamond Railway & Contractors Supply Co., 31 S. Canal St., Chicago, Ill. Phone Franklin 3529.